MODEL AIRPLANE NEWS

MASTER INVERTED FLIGHT

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120 March 1996

Unlimited Racing— MADERA!

— PAGE 20

Learn the Secrets

- Make Scale Antennas
- Run a Successful Scale Contest
- Build Perfectly Straight Fuselages
- Finish with Fabric

Engine Review— Saito FA-100 Twin

KRC Electric Meet

A NEW AIR AGE MAGAZINE!

— see PAGE 58

Dogfighter for a day

R/C Combat Guide

USA $3.95 CANADA $4.95
03>
0 71896 48120 4

TESTED—CGM TIGER 60 •HANGAR 9 EASY FLY 40 •MIDWEST STARDUSTER •CERMARK EXTRA 300S

MODEL AIRPLANE NEWS

MARCH 1996 • VOLUME 124, NUMBER 3

features

construction

columns

reviews

columns

departments

ON THE COVER *(top to bottom): a Formula One racer takes off for another heat at the 1995 Madera Unlimited Air Races. Nick Ziroli Sr. shows off his latest creation—an electric-powered Heinkel 162. Nick flew the German WW II jet fighter at the annual KRC electric meet.) Dressed up in Rich Uravitch colors is the Cermark Extra 300S.*

ABOVE: *race addict Tom Walker brings in his T-6 Texan after a gruelling heat. T-6 is a very popular class—lots of close racing action and exciting neck 'n' neck battles for the checkered flag.*

EDITORIAL

by TOM ATWOOD

EXPLORING THE AVIATION ADVENTURE

Last summer, at the Wings of Freedom Air Show put on by the Confederate Air Force in Frederick, MD, I was amazed to find *three* magnificently restored B-17s perched along a central taxiway. They sat in quiet repose among a variety of authentic WW II warbirds. As I approached the flying fortresses, I decided to take a closer look at the gun turrets. The belly turret was a particular surprise. The operator placed his feet in stirrups mounted well above his body on the front inside wall of the turret. Handles to control the turret and gun were positioned below the stirrups, outside his thighs. The operator gazed between his knees through the gun sight as the turret pivoted in three dimensions. What a thought to imagine that vigilant gunners would spend hours in the confines of those turrets, protecting their fellow crew members and their ships.

A close look at the Heinkel He-111 and other now-exotic warbirds at the show brought similar fascinating surprises. Air Age editors have countless similar contacts—both military and civilian, historical and contemporary—with the world of full-scale aviation each year. It's no wonder, given that one in four of our readers is a full-scale pilot and that a majority of readers profess a lifelong, consuming interest in the history of aviation. Yet, when we come across fascinating accounts of aviation history, points of view and photo opportunities that are not modeling subjects per se, these stories usually can't readily find a home in *Model Airplane News*. A story recently unearthed by long-standing contributor Budd Davisson involves a WW II ace who was shot down in a Mustang and who survived by stealing a FW-190 from a Germa airfield and flying back to his home field We are pleased to say we now have a veh cle for sharing such compelling stories wit our readers—a new Air Age magazin called *FLIGHT*.

FLIGHT will offer a diverse mixture c quality photography, aviation art, provoca tive perspectives on old and new aircraf reports on museums and air shows, aviatio CDs and flight sims, and "in the cockpit accounts. Do you have an interesting story t contribute? If so, please contact *FLIGHT* c/o Air Age, 251 Danbury Rd., Wilton, C 06897; fax: (203 762-9803; e-mail *toma@airage.com* The premier issu takes off in Apri 1996!

IN THIS ISSUE

In today's work and computer-fille world, it seems w find little time fo the really importan things in life—such as model airplanes One solution to th no-time-to-build problem is ARFs They get us into th air fast but, for many they fall short in the looks department ARCs (almost-ready-to-cover models) ca be covered and finished in exactly the way you want them, and they're quickly becoming one of the most popular products available today. In this issue, we hit both ends o the ARC/ARF spectrum with Hangar 9's Easy Fly 40 trainer and Cermark's Extra 300 skyrocket. Whether you're just starting out or you're the local hotshot, check out these great fliers.

Also, for the "go fast and turn left" crowd, we have unlimited racing at Madera. The news here is the introduction of the sport biplane class! Race for the gold on page 20.

How about being a dogfighter for a day? We joined forces with a local R/C club and put a bunch of R/C combat models into the air for a great day of streamer-cutting action, and we've included a list of the most popular R/C combat models you can buy. If you're bored with just flying, set your sights on this one; like this whole issue, it's a whole lot of fun.

MODEL AIRPLANE NEWS

EDITORIAL

Group Editor-in-Chief TOM ATWOOD

Editor GERRY YARRISH

Senior Editor CHRIS CHIANELLI

Associate Editor ROGER POST JR.

Assistant Editor DEBRA D. SHARP

COPY

Copy Director LYNNE SEWELL

Senior Copy Editor KATHERINE TOLLIVER

Copy Editor ANNETTE PARKER MARTIN

Assistant Copy Editor KATHLEEN J. DOHERTY

ART / DESIGN

Managing Art Director ALAN J. PALERMO

Associate Art Director BETTY K. NERO

Assistant Art Director ANGELA A. CARPENTER

Graphic Artist MICHAEL BOUSE

Staff Photographer WALTER SIDAS

Image Technician CHRISTOPHER HOFFMASTER

CONTRIBUTING EDITORS

Dave Baron, Joe Beshar, Mike Billinton, Mike Cherry, Roy L. Clough Jr., Hal deBolt, Bob Fiorenze, Dave Gierke, Bill Griggs, Henry Haffke, Tom Hunt, Sal Iasilli, John E. Jundt, Michael Lachowski, Andy Lennon, George Leu, Jim Newman, Vic Olivett, Jim Onorato, Dan Parsons, Dave Patrick, Dave Platt, Mitch Poling, Frank Ponteri, Randy Randolph, Jef Raskin, Guy Revel, Carl Risteen, Jim Sandquist, Stephen Scotto, Dave Shadel, Keith Shaw, Jim Simpson, Faye Stilley, Bob Underwood, Rich Uravitch, Roy Vaillancourt, George Wilson, Dave Windom, Rob Wood, Nick Ziroli.

PUBLISHING

Group Publisher LOUIS V. DeFRANCESCO JR.

Publisher YVONNE M. DeFRANCESCO

Associate Publishers GARY DOLZALL
SHARON WARNER

ADVERTISING

Director of Advertising SHARON WARNER

Advertising Account Executives
JILL ELLEN MOLINARO, JENNIFER IZZO
HILARY BURKE REICHHELM

Advertising Traffic Administrator
ELISE SILKOWSKI

Advertising Coordinator ANN T. WIEBER

MARKETING

Director of Marketing GARY DOLZALL

CIRCULATION

Circulation Manager ARLENE A. DELGIUDICE

Circulation/Marketing Coordinator
JENNIFER KELSEY

PRODUCTION

Production Manager MARY REID McELWEE

Production Assistant ARLENE MELKO

SYSTEMS

Systems Manager GORDON OPPENHEIMER

CORPORATE

Chairman DR. LOUIS V. DeFRANCESCO
Chief Executive Officer MICHAEL F. DOYLE
Vice President G.E. DeFRANCESCO
Secretary L.V. DeFRANCESCO
Treasurer YVONNE M. DeFRANCESCO

INTERNET *man@airage.com*

MODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age Inc., 251 Danbury Rd., Wilton, CT 06897-3035.

Second-class-postage permit paid at Wilton, CT, and additional mailing offices.

SUBSCRIPTION INFORMATION: call (800) 827-0323. U.S.: $34.95 for one year, $55.95 for two years. Canada: $51.31 for one year, $87.69 for two years (Canadian prices include G.S.T.). Elsewhere: $47.95 for one year, $81.95 for two years. Canadian G.S.T. registration no. R130754872. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 0609145.

EDITORIAL: send correspondence to Editorial Dept., *Model Airplane News,* 251 Danbury Rd., Wilton, CT 06897-3035. We welcome all editorial submissions, but assume no responsibility for the loss of or damage of unsolicited material. To authors, photographers and people featured in this magazine: all materials published in *Model Airplane News* become the exclusive property of Air Age Inc., unless prior arrangement is made in writing with the Publisher.

ADVERTISING: send advertising materials to Advertising Dept., *Model Airplane News,* 251 Danbury Rd., Wilton CT 06897-3035. Phone (203) 834-2900; fax (203) 762-9803.

CHANGE OF ADDRESS: to make sure you don't miss any issues, send your new address to *Model Airplane News,* P.O. Box 428, Mount Morris, IL 61054-9853, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage.

POSTMASTER: please send Form 3579 to *Model Airplane News,* P.O. Box 428, Mount Morris, IL 61054-9853.

AirAge PUBLISHING

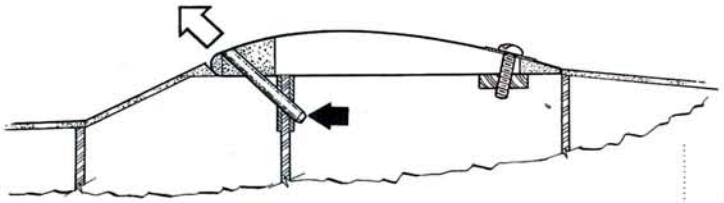
Member Audit Bureau of Circulations

PRINTED IN THE USA

Hints & KINKS

by JIM NEWMAN

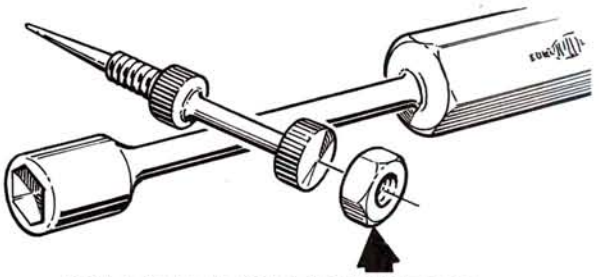
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



BOLT-ON HIGH WING

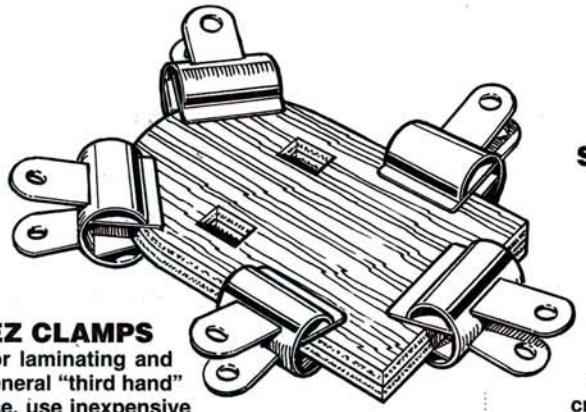
Glue a dowel into the wing leading-edge block as shown (make sure that the dowel fits firmly into the reinforced former). To ensure alignment, drill the angled hole in the block and the former at the same time.

David Lewis, Bay Village, OH



SAFER NEEDLE ADJUSTING

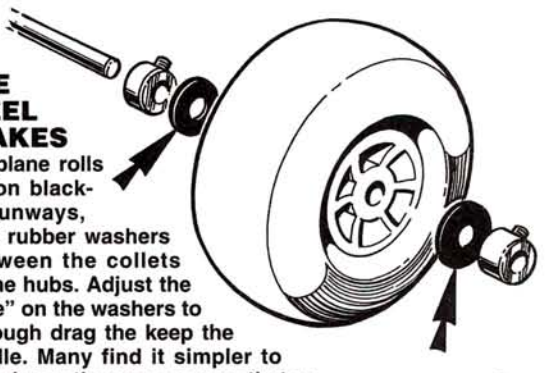
Solder (or use JB Weld) a nut to the needle valve as shown, then use a nut driver to keep your fingers well clear of the propeller. An alternative would be to attach the head of an Allen screw to the needle, then use a ball-ended Allen wrench. ***Larry Renger, Cerritos, CA***



EZ CLAMPS

For laminating and general "third hand" use, use inexpensive paper grippers. When you use the clamps to hold balsa, use plywood scraps for padding.

Bob Handley, Goodyear, AZ



SIMPLE WHEEL BRAKES

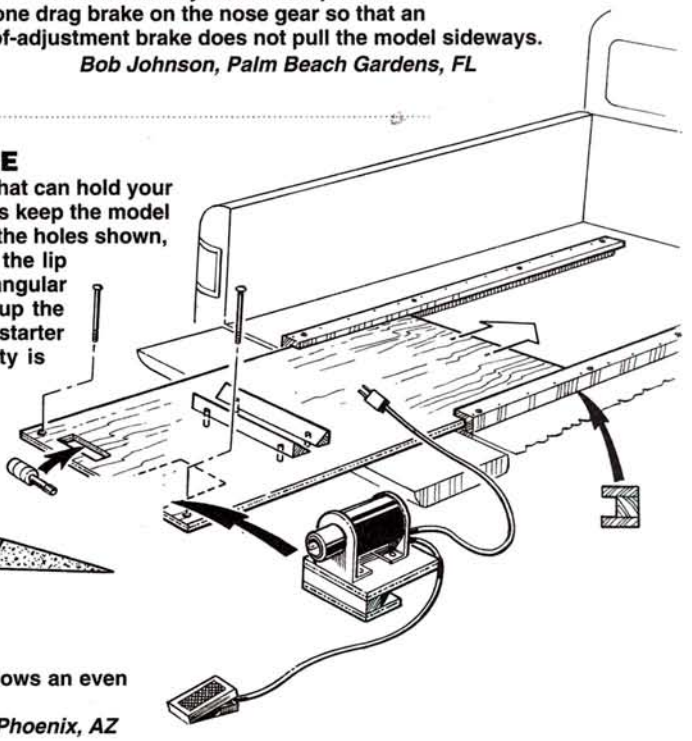
If your plane rolls away on black-top runways, trap rubber washers between the collets and the hubs. Adjust the "squeeze" on the washers to create enough drag the keep the plane still at idle. Many find it simpler to use one drag brake on the nose gear so that an out-of-adjustment brake does not pull the model sideways.

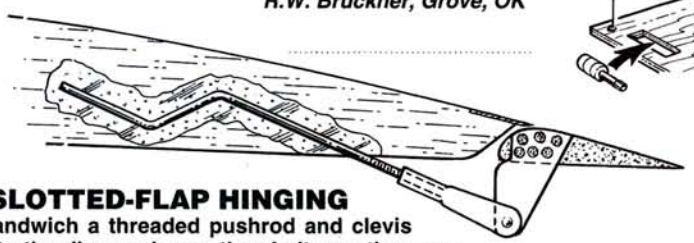
Bob Johnson, Palm Beach Gardens, FL

LONE FLIER CONVENIENCE

The wooden tracks on this truck hold a plywood platform that can hold your model and be slid out for all-around access. Plug-in chocks keep the model still. When you want to start the model, drop pins through the holes shown, then push the plywood back. The mounted starter fits on the lip of the plywood and is plugged into the flight box. A rectangular hole prevents the Ni-Cd from rolling to the ground. Pick up the plane, stand *behind* the wing to push the spinner into the starter cup, then activate the starter with the foot switch. Safety is paramount.

R.W. Bruckner, Grove, OK





SLOTTED-FLAP HINGING

Sandwich a threaded pushrod and clevis into the ribs as shown, then bolt a mating control horn to the underside of the flap. This strong hinge allows an even gap adjustment along the span of those slotted flaps.

Reuben Schneider, Phoenix, AZ

MODEL AIRPLANE NEWS
HOW TO

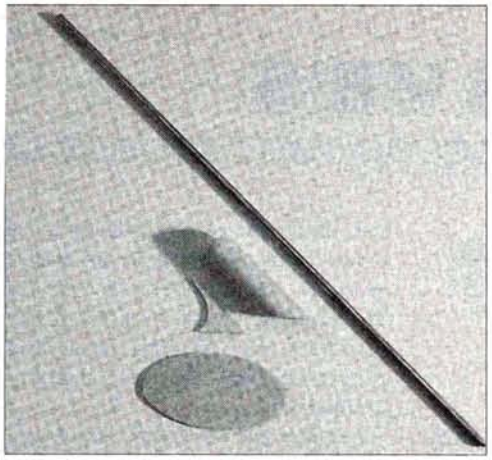
by JIM SANDQUIST

SMALL DETAILS are often the difference between an average-looking model airplane and a really special one. Many subjects have antennas that are difficult to reproduce, and some sport models can be greatly enhanced by scale-looking antennas.

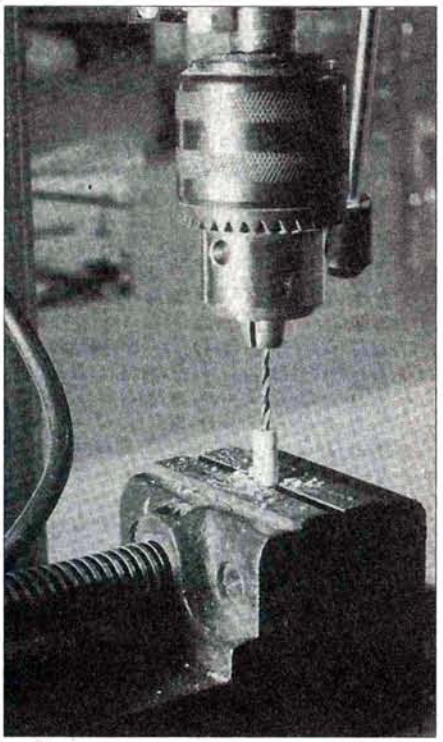
I used the process shown here on my 1/4-scale Stinson L-5, which took first place at the Toledo Aviation Show in 1995. It isn't very difficult.

MAKE Scale Antennas

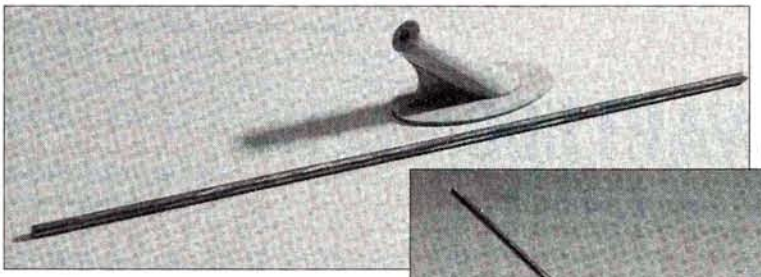
A quick and easy detail for improved appearance



1 ***Cut out the needed components. The oval base and side support are cut out of 1/16-inch-thick plywood. The 1/4-inch-diameter dowel is approximately 1 inch long. Determine the antenna length and, depending on the scale size needed, cut it out of 2-56 or 4-40 wire.***

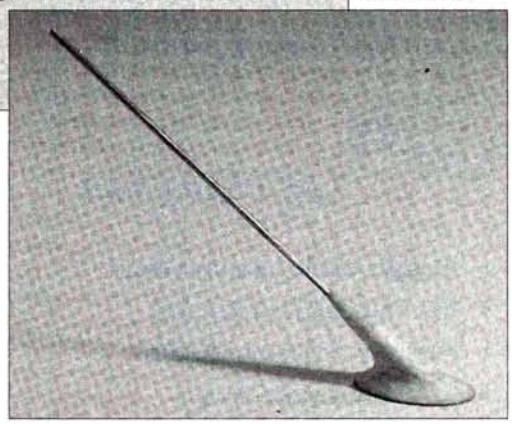


2 ***Use a drill press to drill a hole through the center of the dowel so that the antenna wire has a snug fit.***

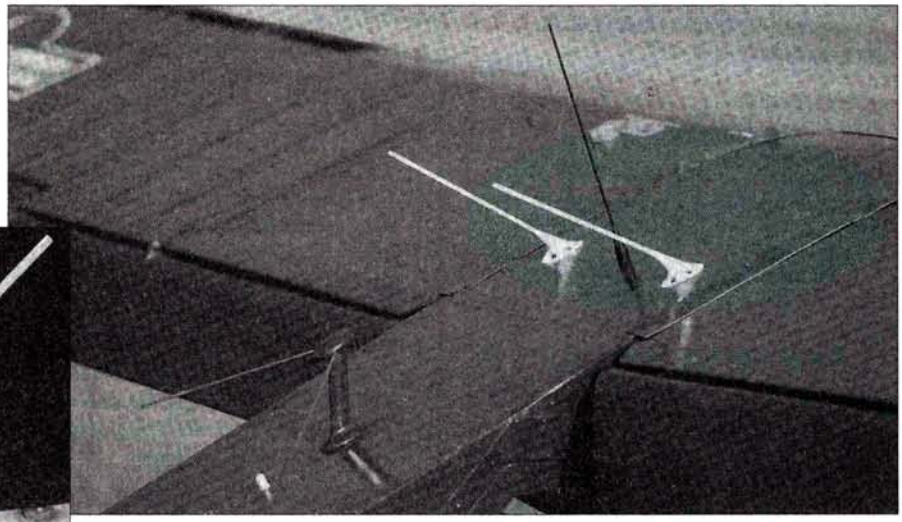


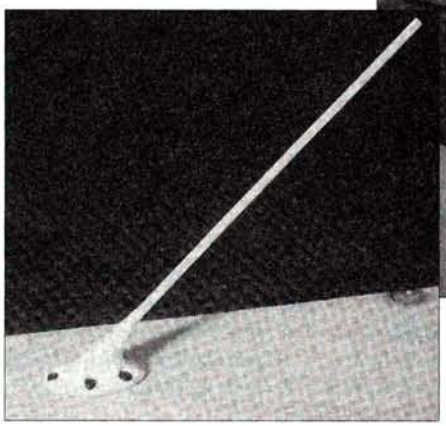
PHOTOS BY JIM SANDQUIST

3 ***Glue the plywood base components together with CA.***



4 ***Use Carl Goldberg Models Epoxy Plus to blend everything together. This two-part epoxy can be shaped and smoothed out easily with wetted fingertips. Very little sanding is required once it has set. Mix the two parts of the Epoxy Plus in equal amounts, and spoon the mixture into the areas that you want to blend together. You will have approximately 10 minutes of working time before it has set. Smooth out the epoxy with a wet finger. After it has dried thoroughly, finish-sand it, prime and paint.***

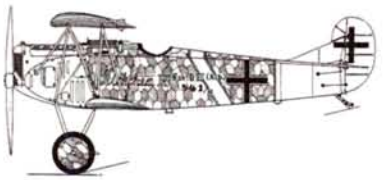




5 ***Drill holes in the base for the mounting screws, and screw the mount into place on your model. The threaded part of the screws below the base can be cut off, and if you like, the base can simply be glued into place. The final product looks very convincing, and it replicates the antennas used by the full-size general aircraft industry on a variety of planes. Good luck!*** +

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News** Danbury Road, Wilton, CT 06897-3035; e-mail: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing tremendous numbers of letters we receive, we can not respond to every one.



FOKKER CAMO

I've been reading your magazine for the past six years, and my friends and I really appreciate the wonderful articles and features. I have recently encountered a problem that I hope you can help with. I am building a Sterling Fokker D-VII, and I have no idea how to draw the proper lozenge pattern on the Solartex covering material. After I have the pattern on the cloth and the cloth on the model, I intend to hand paint the colors. If you can provide any assistance, I would be eternally grateful.

PAUL H. SCHAEFER
Edgewood, NM

Paul, I've never used this technique, but I know a modeler who has, and his model came out very well. First, get a 3-view or plans set that shows the unique lozenge color pattern. Model Airplane News has a nice set of scale Fokker D-VII drawings by J. Nietro that includes a top view of the wings that shows the pattern (order no. SDP01024—$8; see "Pilots' Mart"). Use a copier to enlarge the scale plans so the wing with the pattern shown has the same size chord as your model's wing. Place "pattern paper" (carbon paper used to transfer patterns to cloth for sewing) between the scale enlargement and the covering material. Place the materials on a smooth table or bench, and firmly trace the pattern with a ballpoint pen. The pattern will be transferred to the material and will serve as a guide for painting after the material has been applied to the model. You must apply the covering material as straight and precisely as possible so the pattern will be positioned correctly. When you shrink the wrinkles out of the material, try to apply the heat evenly to minimize distortion of the pattern. After it has been painted, weathered and clearcoated with a fuelproof top coat, the camo will look very authentic. I hope this helps. GY

SIZING UP AN ULTIMATE

Help! I'm very sick. Nine years ago, I got "Aeromodelitis Chronicus"—a rare fever that forces me to go to the flying fi every Sunday morning to put someth in the sky and, from time to time, cau an irresistible impulse to glue somethi *Model Airplane News* has always been perfect medicine with those amazing useful articles.

My first giant-scale project was a P Big Rainbow with a Webra .91. Now in love with giant scale, so I got an Quadra (35cc, 6,000rpm with a 2(prop) from a friend. I want to build Extra 300 for this engine. What should wingspan be? I have no idea. I hope can help!

RODOLFO LAZO ARA
Concepcion, Cl

Rodolfo, I think a 72- to 80-inch-sp Extra would be well-powered by a 3 engine. Try to keep the model's ready-to weight at or less than 15 pounds. Go luck, and when you've finished, send i photo for our "Pilot Projects" column.

GLIDER GUIDER THANKS

Thanks, and "well done" on your inclusi of sailplane kit reviews in recent issues imagine that the bulk of your readers interested in power planes, but there are lot more of us "glider guiders" out here th you might imagine. But maybe you do re ize that; thanks for your support of the F Soaring Exchange on the Net!

Maybe with more excellent reviews a gorgeous color photos of the latest sailplanes, we'll be able to swell the ran of your readership and our corner of t hobby even more. Keep it coming!

BOB KID
publish@pop.uky.e

Bob, we appreciate your input. "Sile fliers" are becoming increasingly popula and we will continue to report on this aspe of the hobby. Check out this month "Center on Lift" column by Mike Lachows for more sailplane news and reviews. D

ALL WASHED OUT?

I'm often surprised at the similarities between design principles of full-scale and model aircraft. It's no wonder that I am especially fond of your enlightening technical columns, which, among other things, are why your magazine is far superior to the competition. I am debating whether or not to add washout to a wing on a scratch project. I have heard many pros and cons on this subject. Many of my modeling peers have told me that washout has little to no effect on a small-scale wing, and that in warm climates, it will cause the wing to return to its original zero washout position. Could you please settle the debate by offering your expert advice?

JOHN BOOTHE
Eustace, TX

John, as you know, wing washout allows the wing root to stall before the wingtip does. Therefore, at slow air speeds, washout helps to maintain some degree of aileron control. On a model, washout should be built in with the use of jigs or rib templates, rather than twisting the wing and heating its covering. Warm temperatures can change the amount of twist, and if the heat twists the panels in opposite directions, your plane will turn better in one direction than it will in the other. If your wing is as small as you say it is, does it have ailerons? If so, a small amount of washout would be helpful (built-in, of course). On the other hand, if you fly at slow air speeds with a high angle of attack, you should use your rudder to control the plane, because it is the most effective wing-leveling control when the plane is in this configuration. I generally fly with both thumbs (rudder and aileron sticks) moving in the same direction; if the plane becomes too slow, this method helps to enhance slow aileron response. Good luck, and don't use bleach. RP

HOW-TO ARTICLES WANTED

Do you have a construction technique, building method, or design innovation that you'd like to share with readers?

Why not publish your ideas in Model Airplane News?
For more information, contact Debra Sharp (203) 834-2900.

Aerobatics MADE EASY

by DAVE PATRICK

FLYING (AND THINKING!) UPSIDE-DOWN

OVER THE YEARS, I've seen some great pilots perform very impressive maneuvers—from Lomcevaks to flat spins and torque rolls—but nothing gets as much attention as a simple, well-executed, low inverted pass. When I was a fledgling pilot, I dreamed of achieving such skill. Even today, after practicing a complex pattern, an inverted pass before landing seems to impress my audience the most—sheesh!

So without further ado, let's walk through your first attempts at inverted flight with emphasis on more precise execution.

THE PLANE! THE PLANE!

Although you don't need a fancy "super-duper special" to fly inverted, you do need at least one plane that's capable of sustained inverted flight. The good news is that most planes—even some trainers with flat-bottom airfoils, such as the Goldberg Eagle—can accomplish this when powered by a decent engine. But, generally, aircraft with semisymmetrical to fully symmetrical airfoils are best for inverted flight, especially if the models are sport aerobatic designs. If in doubt, ask fellow club members or a local hobby shop for advice.

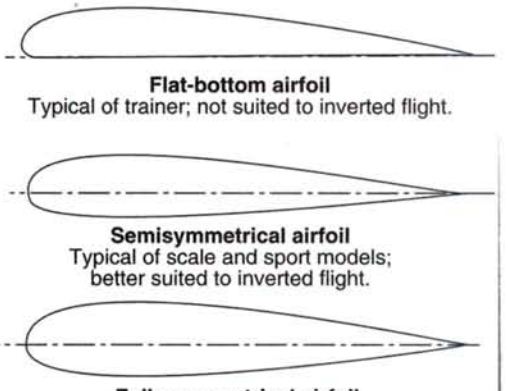
THE FIRST LEAP

If you can roll, you can at least get your plane inverted. Now, staying inverted under control, well....

Before you try your first inverted flight, anticipate what to expect. A little "dry" flying can go a long way here! It's important to note that, while inverted, your elevator will operate backward—"down" will be "up," and "up" will be "down." If you forget this at the wrong moment you will pay with a trip to the hobby shop.

The silver lining is that the ailerons are not backward, so turning is "normal." Did I forget to mention that rudder is backward? Well, never mind; we'll leave the rudder stuff for later for the advanced guys.

Figure 1. Airfoils for inverted flight

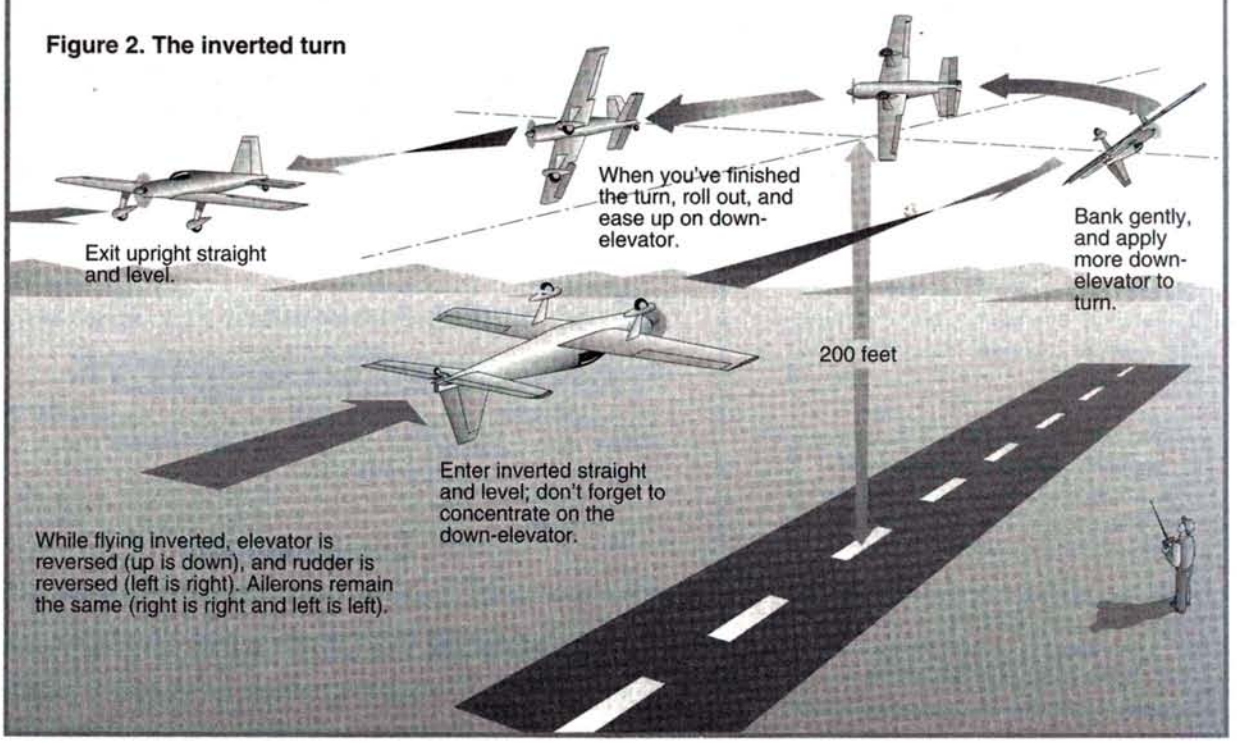


Flat-bottom airfoil
Typical of trainer; not suited to inverted flight.

Semisymmetrical airfoil
Typical of scale and sport models; better suited to inverted flight.

Fully symmetrical airfoil
Typical of aerobatic model; ideally suited to inverted flight.

Figure 2. The inverted turn



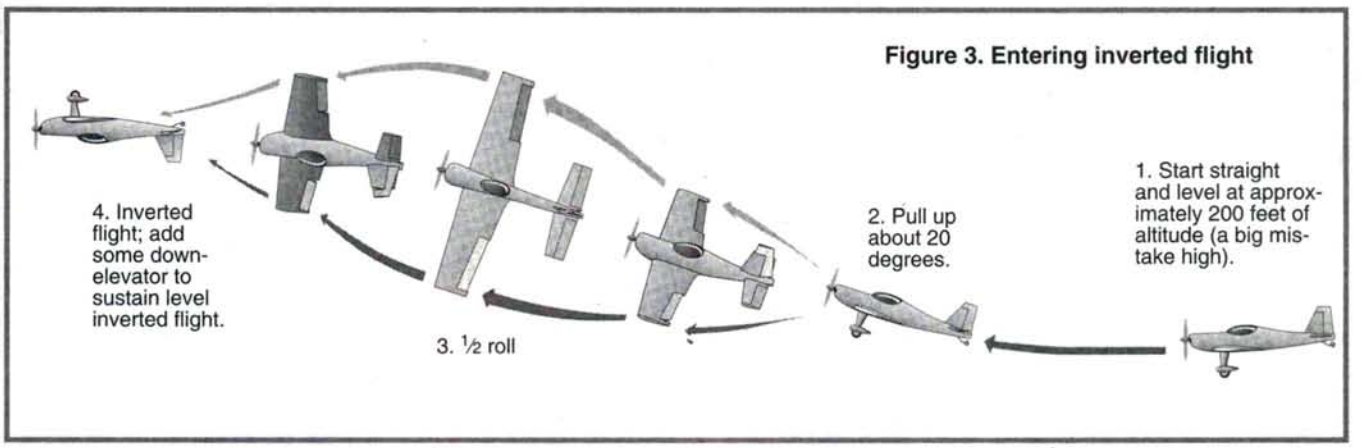


Figure 3. Entering inverted flight

So, you've picked a beautiful day for your first inverted flight, and you've climbed at least to "a big mistake high," let's say 200 feet or so. When you feel comfortable and the model is straight and level, pull the nose up gently to about 20 degrees, relax, and perform a ½ roll. Now that we're starting to get really advanced, let's work on perfecting the roll to inverted. To help clean up the transition, add a little "top" rudder. Instead of pulling up slightly before rolling to inverted, start the roll from straight-and-level flight. If you're rolling left, start to add some right rudder as the wings pass through 45 degrees, increasing it until the wings reach 90 degrees and decreasing it until there is no right rudder as the wings pass 135 degrees. Try not to roll too quickly; about 1½ to 2 seconds for 180 degrees seems about right. Remember, as you roll out from inverted, you'll need left rudder if you want to continue to roll left.

To improve your comfort level, practice. Now that you're getting pretty good at this, start lower and, in no time, you'll be able to do those breathtaking inverted passes at a low altitude. Now maybe add some smoke...yes!

AirSCOOP

by CHRIS CHIANELLI

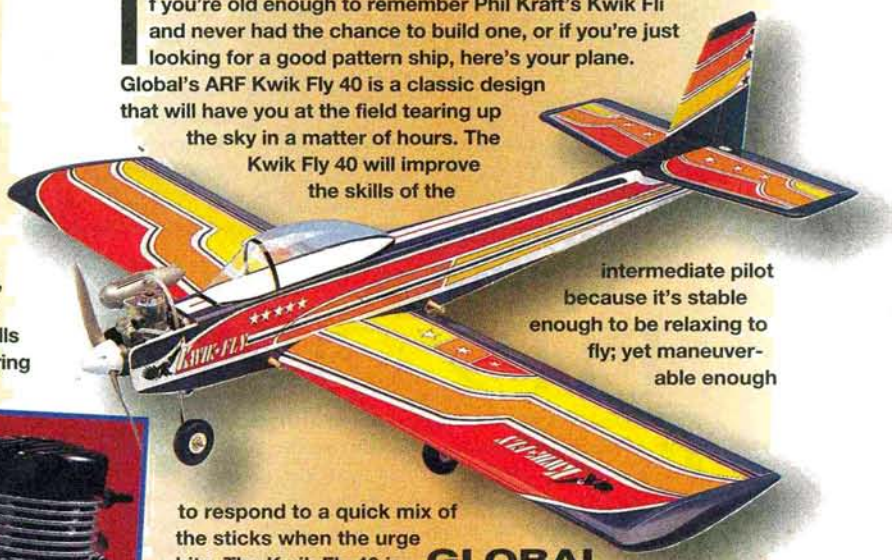
New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

ISC GMS 2000

ISC International's Jimmy Goad Jr. showed us their new line of Chinese-made engines at the Chicago Hobby Trade Show. The GMS 2000 is available in .40ci ($164.95) and .47ci ($174.95) displacement, and both include a muffler. GMS stands for Goad, Mui and Shum—the people behind the engine. The first engine was tested in 1993 and, from the start, Jimmy tells us that no compromises were made in design, engineering and performance. The final test was made in the air with the GMS 2000 pulling a Lanier Fun Fly 40. New, out of the box, the engine (equipped with a Mac-tuned pipe, turning a Master Airscrew Scimitar prop and burning 5-percent nitro fuel) tacked 17,100rpm after only six flights. For high performance at sport-engine prices, check out the GMS 2000. Distributed exclusively by ISC International Inc., P.O. Box 40116, Indianapolis, IN 46240; (317) 844-1978; fax (317) 848-1015.

GLOBAL Kwik Fly 40 ARF

If you're old enough to remember Phil Kraft's Kwik Fli and never had the chance to build one, or if you're just looking for a good pattern ship, here's your plane. Global's ARF Kwik Fly 40 is a classic design that will have you at the field tearing up the sky in a matter of hours. The Kwik Fly 40 will improve the skills of the intermediate pilot because it's stable enough to be relaxing to fly; yet maneuverable enough to respond to a quick mix of the sticks when the urge hits. The Kwik Fly 40 is 90 percent complete out of the box, and it comes with a complete hardware package and an illustrated instruction manual. All you need is an engine, a radio and a prop. WS—57 in.; L—46 in.; wing area—584 sq. in.; engine—.40-.46 2-stroke; radio—4-channel req'd. For more information, contact Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.



Aeroplane Engines

Chuck Gill, that silver-haired icon, and his devoted son Keith of The Aeroplane Works (the makers of kits for Nick Ziroli plans) have just informed us that they are selling US Engines' 35cc and 41cc gasoline engines. Made in the USA, these engines are reasonably priced and perfect for many of the kits that Chuck and company sell. For more information on these engines, call Chuck at the Aeroplane Works: (908) 356-8557, or U.S. Engines: (800) 476-7747.

CJM Jumbo gear

For those giant-scale modelers who are looking for retracts for really big aircraft (over 50 pounds), Century Jet Models has just released a new, upgraded version of their giant retracts. These include stainless-steel mounting rails and two pneumatic cylinders. These babies can lift any size wheel and tire! Shown is one of the main gear from the CJM Grumman F-7-F Tigercat gear set. For more information, contact Century Jet Models, 11216 Bluegrass Pkwy., Louisville, KY 40299; phone (502) 266-9234; fax (502) 266-9244.

The Cool Redhead

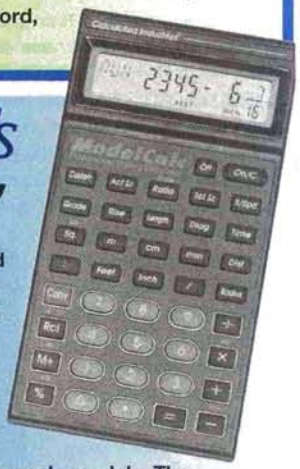
The pretty redhead with the bold, white engraved name on it is the latest Davis Diesel conversion head; the engine is a Tower 40. This particular diesel converter can also be used on a variety of other engines, including the Magnum GPA .40, Thunder Tiger .40 GP and the O.S. .40FP/FSR.

If you're wondering what a Davis Diesel converter head will do for you besides eliminate the need for your old glow plugs, the converted engines will turn an 11x7 prop at 11,000rpm or a 12x6 at about 10,000rpm. They run about 20 minutes on 6 ounces of fuel. Davis Diesels also produce less noise! Davis Diesel systems are available for most O.S. engines as well as SuperTigre, Webra, Rossi, Fox, Enya, OPS, K&B, Thunder Tiger and Magnum in sizes from .049 to a 3.6 Tiger Twin. For more information, contact Davis Model Products, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

FUTABA'S PIEZO

Futaba is now offering a piezoelectric rate gyro for use with most heli and fixed-wing models. The Futaba FP-G501 rate gyro features very fast response speed and high gyro sensitivity made possible by using a piezoelectric ceramic element as the angle sensor. There are no moving parts associated with slower response times. To take advantage of the excellent response of the FP-G501, Futaba has designed a high-response coreless servo (FP-S9203). A special suspension is built into the gyro to make the sensor element vibration-proof. The gyro can be adjusted from either the transmitter or the gyro's control box, and it comes with the control box, gyro sensor, control amp and all the wiring connections. For improved control response, check it out. For more information, contact Futaba, P.O. Box 19767, Irvine, CA 92713-9767; phone (714) 455-9888; fax (714) 455-9899.

Scale Modeler's Calculator



Calculated Industries Inc. has developed the ModelCalc™—a new dimensional calculator designed specifically for the scale modeler who works with proportions, i.e., scaling-up 3-views for scratch-building models. The ModelCalc™ has four custom "User-Set" scales and 22 common modeling scales, e.g., HO, N, G, 1:24 and 1:400, which are typical of scale-model railroading or plastic scale models. The calculator computes right-angle solutions, circular solutions, scaled and actual speed solutions and more; it even works as a standard math calculator. The paperless tape function lets you review up to the last 20 entries. To save time and increase scaling accuracy, the ModelCalc™ might just be for you. List price: $59.95. For more information, contact your local hobby dealers or Calculated Industries Inc., 4840 Hytech Dr., Carson City, NV 89706; (800) 854-8075.

SCALE STITS COVERING

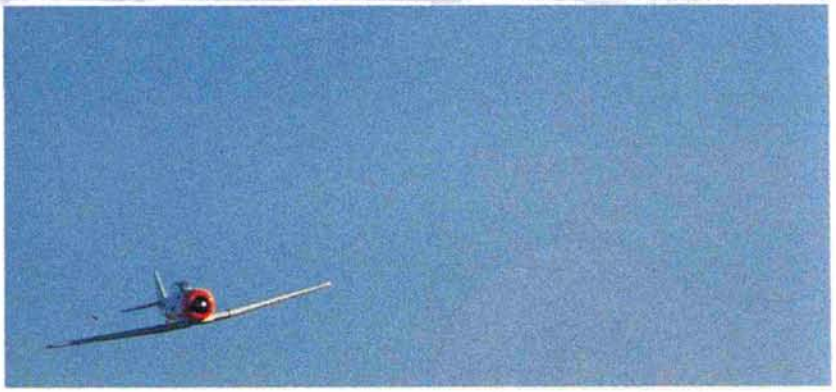
F&M Enterprises' authentic covering material has been used by many giant-scale modelers to produce excellent finishing results. Their Scale Stits Covering System uses a specially formulated polyester fabric cloth and a complete line of finishing products that make scale-covering jobs easy. These products include Poly-Fiber fabric; Poly-Tak adhesive; four sizes of pinked finishing tape; Poly-Brush to fill the cloth weave; Poly-Spray, which contains talc and aluminum pigment; and Poly-Tone—which includes more than 120 colors! Feather-Coat and Superfil filler materials round out the line. All of F&M's products come ready to spray out of the can, and they clean up easily with MEK. To get a scale finish, use what the big guys use. For information, contact F&M Enterprises, 22522 Auburn Dale, El Toro, CA 92630; phone/fax (714) 583-1455.

ROBBE/ AVEOX Alliance

The Aveox brushless motor captured first place in the F5B championships and is one of the more interesting recent developments in electric modeling. Robbe and Aveox have announced a joint venture, under which both companies will develop and market top-quality electric motors for the hobby. Collaboration over the next several months is likely to lead to new and interesting products. We'll keep you posted.

MAD UNLIMIT

No. 690 was flown by Denny Baker for DB Racing, San Jose, CA.



by ROB WOOD

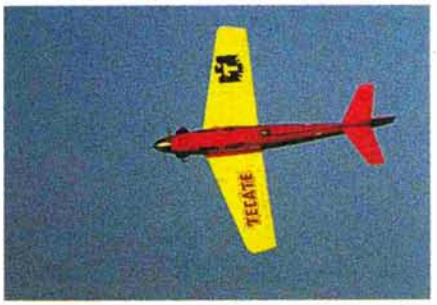
GIANT-SCALE racing celebrated its fifth anniversary at Madera, CA, on September 27 through October 1, and what a celebration it was! A record number of spectators showed up to watch 187 Unlimiteds, Texans, Formula Ones and Biplanes (new for 1995), as they slugged it out for cash and trophies.

Although the entrants numbered slightly fewer than in previous years, the overall quality of the aircraft had never been higher. Speeds continued to increase, too; 200+mph was a common radar reading in the Unlimited Gold speed dashes. No sooner is a record set than it's broken. Kent McKenna set an all-time record for six laps at Galveston last year (a 101.25), and the record held for exactly two months. It was broken in heats at Madera by Rob Pastor with his Aerrow-powered Stiletto, Rusty Van Buren, David Van Linsowe and Don Albright. In the Gold Trophy Dash, Don's Lancair IV powered by an A-Cubed 8.8 set a new, all-time record with a blistering 95.46.

First-place Gold Unlimited at Madera for the second time! No. 068; all-wood Lancair built from Wendell Hostetler plans by Wendell himself; flown by Don Albright of the Braun Racing Team; A-Cubed-powered. Just goes to show you don't need an expensive, super-high-tech-composite machine to win.

BREAKING RECORDS

A new world record was also set in the Unlimited qualifying rounds. Don Albright completed the two laps with an unbelievable 28.12—14.6 seconds per lap! Unlimited racing is getting tighter, as well, with a scant 5 seconds separating the first and 15 fastest qualifiers.



Outside sponsorship is becoming crucial: Tecate Beer co-sponsored this Quadra-Aerrow 200-powered Hobby Barn Vendetta. Billy Hempel Jr. took first in Silver Unlimited; he won Gold Unlimited at the very first Madera races in 1991.

The closer matching in speeds produced some incredibly exciting racing, with 6/100 second separating the first- and second-place Gold trophy winners, and 3/100 second separating the third and fourth!

AT-6 Texan racing had its share of excite-

The Cosmic Wind—mainly produced by David Bridi and Paul Steiner—is one of the most popular F1 models.

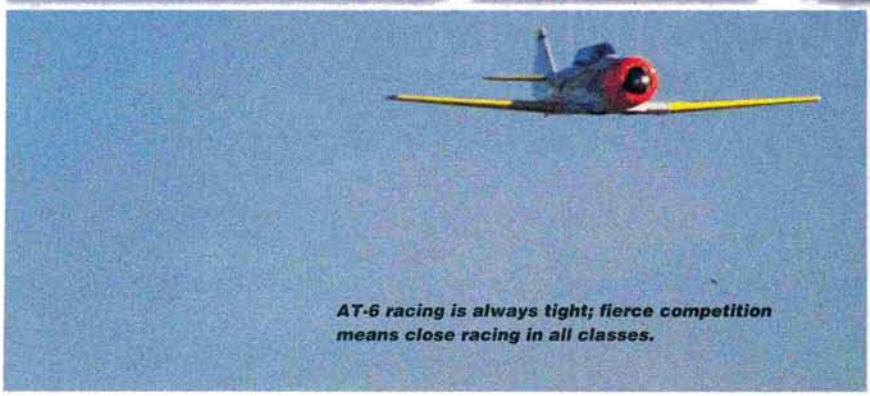
PHOTOS BY ROB WOOD

Pilots rush to the pilots' stand after starting their engines in one of the Bronze heat races—giant-scale racing as exercise! Foreground: Rahm Racing's no. 295 scratch-built Texan placed fourth in the Bronze trophy races.

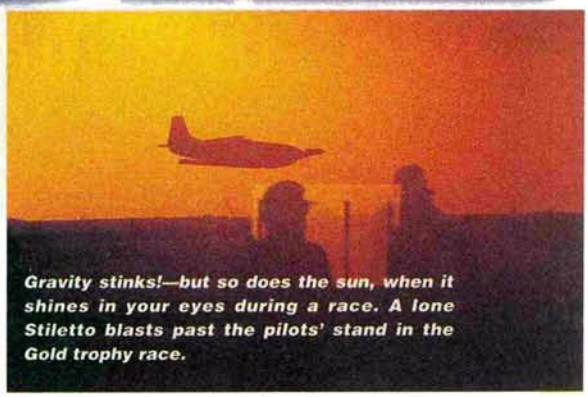
Race Sponsors

Primary sponsors: *Model Airplane News,* The Discovery Channel.
Others: Pacer Technology, Horn-Dog Aircraft, Robart, Klotz, ISC Intl., APC, Samy's Camera, Quadra-Aerrow, Byron Originals, Rahm Inc., Antelope Valley Ford, Airtronics, Tru-Turn, Lanier RC, Ace RC, Herbrandson Engines, Custom Electronics, Horizon Hobby Distributors.

D R A



AT-6 racing is always tight; fierce competition means close racing in all classes.



Gravity stinks!—but so does the sun, when it shines in your eyes during a race. A lone Stiletto blasts past the pilots' stand in the Gold trophy race.

D R A C E S

ment, too. Fred Burgdorf, the man to beat in the Texan class, was finally defeated—but not by time or speed. This year, Fred's venerable Texan was taken out by one flown by Gary Hover (another well-known flier). A law of physics states that two objects can't occupy the same space at the same time, and it was Fred's misfortune to lose the argument. Gary's plane continued to fly, but was grounded by flightline personnel. As everyone says, at one time or another: that's racing!

Aero Sport's Archie Snider took second in Gold with this 25-pound RacePro AT-6. Archie's team took two golds and one silver in the class.

AT-6 qualifying heat times had a much larger spread than we had seen in past races: 9 seconds separated first and sixth; 10 seconds separated seventh and 15th, and so on. The reason for this is anybody's guess, but we were certainly treated to some spectacularly close races and the number of midair collisions we've come to expect as a result.

Rob Pastor and friend Diane have captured the hearts of the racing community. "The Kid" flies his Stiletto a few feet off the deck at 195mph, and he has proven that skill, persistence and determination win trophies.

Ron Eisner brings his 1/3-scale, Quadra/-Aerrow 75RSS-powered Performance Model Aircraft Weeks Solution in for a landing. Kit will be available early in 1996; 1,460 square inches of wing area.

FORMULA ONE

Formula One racing has come light years since it was introduced last year at Galveston. The Horndog Nemesis is coming on strong—only slightly bettered by the Horndog GR-7! Dave Bridi's* kits are finally coming into their own, and Paul Steiner's Cosmic Wind is still hanging in there. Two DCU Nemesis aircraft landed trophies, and the battle in '96 will probably be between the Nemesis and the GR-7s. Both have high-aspect-ratio wings and are highly streamlined.

SPORT BIPLANE

As if all of this excitement wasn't enough, Madera '95 saw yet another

General Statistics

- Spinners: overwhelmingly Tru-Turn*.
  Retracts: overwhelmingly Robart*.
- The five Gold Formula One trophy winners completed their six trophy laps in less time than did the five Bronze Unlimited trophy winners.
- All five Silver Formula One winners were members of the same team; congratulations to the Blues Brothers Racing team!
- All but eight of the AT-6 entries weighed 28 pounds or less.
- All five Gold AT-6 trophies—and both alternates—were won by 25-pound Texans built from Race Pro Engineering* kits.
- Six of the 13 Unlimited trophy winners were scratch-built.
- Six of the 13 Unlimited trophies were won by Aerrow 200-powered aircraft. Four were won by A-Cubed, 8.8cid engines, one by a Herbrandson*, one by a Sachs* 5.8 and one by a 3W* 120.
- The A-Cubed 8.8cid has won every Unlimited race in which it has been entered.
- The Lancair IV flown by Don Albright is the first Unlimited to win the Gold twice at Madera and the first all-wood Unlimited Gold winner.
- Since it was introduced in 1993, a Lancair IV has won the Gold every year at Madera.

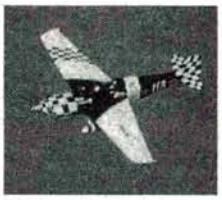
new class. Sport Biplane includes aircraft that weren't necessarily designed as racers, e.g., the Pitts, Christen Eagle, Imperial Knight Twister, the Weeks Solution and the Ultimate Bipe. Lesley Burnett wanted to keep the races fresh with new entries, while still allowing kit manufacturers who have bipes already in production to participate.

Unlimited Bronze winner—D&W Aircraft Roto Finish—was flown by Wayne Voyles for White/ Lanier and featured a Quadra-Aerrow 200.

The rules are rather basic: bipes must appear on the Madera qualifying list, must have a minimum of 1,460 square inches of wing area, must be scale models of their full-size counterparts, and must run engines no larger than 4.6cid; 12-percent root and tip thicknesses are required, and although engines may be modified, tuned pipes are not allowed.

Smoke on! Every race was started by a pace plane. This 21-pound Airtrax Aggressor by MAT was powered by a Quadra-Aerrow 75 and reached speeds of 145mph+. The aerobatic sport plane is in production and will be available in February '96.

Although the number of bipes entered was small, the racing was exciting. Speeds were comparable with the Silver Formula One class, and the airplanes navigated the three-pylon course nicely. One exciting moment occurred when Ron Eisner, flying his Discovery Channel-sponsored Weeks Solution, attempted to take off just behind Kent McKenna's nosed-over Full Tilt



Tom Easterday—co-founder of the Madera races—flew this DCU Nemesis to victory in the F1 Silver trophy dash. All five Silver trophies were won by the Blues Brothers team.

Veteran John Krohn clinched the top spot in F1 Gold with this Horndog Gr7 with a Quadra-Aerrow 75RSS powerplant. The Gr7's high-aspect-ratio wings give it amazing turning ability.

Biplane

Pos.	Race no.	Pilot	Team	Type/Kit	Engine/Radio
1	82	Cliff Sands	–	Imperial Knight Twister/Horndog	J&K 4.4/Futaba
2	069	Jimmy Goad Jr.	Indy R/C	Sean Tucker Pitts/Indy R/C	Zenoah 4.45/JR
3	92	Wayne Voyles	White Lanier	Weeks Special/Ace Pre. Eagle	4.2/Futaba

AT-6

Pos.	Race no.	Pilot	Team	Kit/Radio	Wt. (lb.)
Gold					
1	91	Bubba Spivey	White Lanier	Race Pro/Futaba	25
2	191	Archie Snider	Aero Sport	Race Pro/JR	25
3	333	D. Von Linsowe	Race Pro	Race Pro/Futaba	25
Silver					
1	008	Jim Maroney	JMD Racing	Byron/JR	25
2	091	Karl Allmendinger	Aero Sport	Race Pro/JR	25
3	2	K. McSpadden	Bad Moon Racing	Byron/JR	25
Bronze					
1	91	Ken Knowles	Chevron	Race Pro/Futaba	25
2	111	Gary Korpi,	Pennzoil	Yellow Aircraft/JR	29
3	90	Larry Sutherland	Sutherland	Saxton/Futaba	26

Formula One

Pos	Race no.	Pilot	Team	Type/Kit	Engine/Radio
Gold					
1	88	John Krohn	Laidback Racing	Gr7/ Horndog	Quadra 75/Futaba
2	671	Ken McBride	McBride	Nemesis/Horndog	George 4.2/Futaba
3	702	Fred Weaver	Falcon Racing	Cosmic Wind/Steiner	Husky 4.4/Airtronics
Silver					
1	118	Tom Easterday	Blues Bros.	Nemesis, DCU, Laski	3W/JR
2	3.14	Ken Thornton	Blues Bros	Ole Tiger/	Quadra 75/Airtronics
3	877	J.Arsenault	Blues Bros.	Cosmic Wind/Horndog	3W/JR

Unlimited

Gold					
1	68x	Don Albright	Braun Racing	Lancair/ Hostettler	A-Cubed 8.8/ Airtronics
2	886	D. Von Linsowe	A3 Racing	Lancair/K.T. Aviation	A-Cubed/ Futaba
3	126	Rob Pastor	Discovery	Stiletto/Sky	Aerrow 200/Futaba
Silver					
1	1	Bill Hempel Jr.	Vendetta	Hobby Barn	Aerrow 200/Futaba
2	680	Frank Noll	Braun Racing	Lancair/Scratch	A-Cubed 8.8/Airtronics
3	9	Jay Replogle	Mike Johnson Racing	Lancair/Dr. J	Aerrow 200/JR
Bronze					
1	02	Wayne Voyles	White Lanier	Roto Finish/D&W	Aerrow 200/Futaba
2	87	John Krohn	Laidback	Sea Fury/Scratch	Aerrow 200/Futaba
3	187	Ken Trainor	–	P-39/Zimmerman	Sachs 5.8/Futaba

Best Of Show

Biplane—667, Ron Eisner . . . . . Discovery . . . . . Solution Rs/Performance Quad.75rss./Futaba
AT-6—93, Takashi Komura . . . . . Japan . . . . . Race Pro . . . . . JR
F. One—671, Ken Mc Bride . . . . . McBride . . . . . Nemesis/Horndog . . . . . George 4.2/Futaba
Unlimited—68x , Don Albright . . . . . Braun Racing . . . . . Lancair/Hostettler . . . . . A-Cubed 8.8/Airtronics

GSARA Grand National Champions

AT-6—Race 91, Bubba Spivey
Formula One—88, John Krohn
Unlimted—02, Wayne Voyles

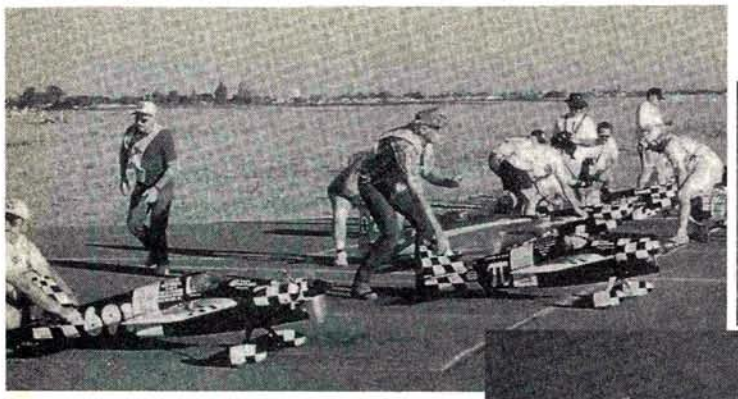
Top Unlimited Qualifier (two laps) total in seconds—no. 68x, Hostettler, Lancair IV flown by Don Albright, A-Cubed 8.8-powered: 28.12—*a record.*

Top Race Times (six-laps)—no. 68x, Hostettler Lancair IV flown by Don Albright; A-Cubed 8.8-powered: 95.46—*a record.*

Biplane—no. 88, K.T. Aviation Full Tilt Boogie flown by Kent Mckenna; Laski 3W-powered: 125.62.

AT-6—no. 027, Horndog Texan flown by Gary Hover: 129.16.

Formula One—no. 671, Horndog Nemesis flown by Ken McBride; J. George 4.2-powered: 121.67.



All Blues Brothers Silver F1s. If John Belushi could see us now...

Bill Miller's Sea Fur touches down afte posting radar speeds o 180mph+ in practice The Sea Fury is gainin popularity—especiall with a Ken Laski-modi fied Quadra-Aerrow 20 up front.

This scratch-built Ole Tiger flew beautifully, and it did its part to help land fourth in F1 Silver for "Blues Brother" Mike Hatfield.

Boogie. Ron misjudged his climb rate (just a smidgeon) and neatly removed the Boogie's T-tail with his landing gear. It all happened so fast that Ron only noticed something was amiss when his Solution seemed to be flying much faster than usual. And, of course, it was faster, because its landing gear had been left behind with Kent's broken tail! Ron flew the Solution out of harm's way until the heat was over, and then he made a perfect belly landing, dead center on the runway.

The Biplane class is sure to grow in popularity, and the next race in which they'll be featured—RMG Triple Crown, Marina, CA, February 9 through 11, 1996—should see more entered.

BRIGHT NOSES

No race would be complete without controversy, and Madera '95 had its share. In an attempt to maintain a vaguely defined scale appearance for the AT-6 Texan and to counteract the trend toward streamlining, promoter Lesley Burnett required the cowl diameters on some Texans to be enlarged by ½ inch. Although there were sound arguments for the requirement, many owners of the affected aircraft balked at having to change their cowls with only five weeks' notice, and they threatened to defy the edict. Ultimately, the owners complied, but they arrived with their cowls painted a bright, Day-Glo orange as a sign of solidarity. Unfortunately, the identically painted cowls continually caused confusion among the turn callers, the scorekeepers and the flight-line personnel; but the pro-

Outside sponsorship

It's no secret that giant-scale racing can be expensive, and it's getting more so all the time. Engines, composite materials, kits, custom landing gear, etc., all take their toll on your wallet. And added to these, of course, is the cost of actually getting yourself, your team and your equipment to races. One way to cope is by soliciting sponsorship!

But remember: sponsorship is not a gift; it's an obligation to pay for products, services or financial help in ways other than pulling out your checkbook. As our sport grows, outside sponsors, i.e., those who aren't in the R/C industry, will become increasingly important. Here are some examples of outside support from the last Madera race.

Greg Simpson's Byron Oddfellow was sponsored by the Independent Order of Oddfellows.

Here, Brian Nelson of the Pennzoil Team speaks at the sponsorship seminar; he has raised the standards of team sponsorship.

Left: the Discovery Channel sponsored this RacePro Texan flown by Ron Eisner.

Below: Billy Hempel hooked up with Tecate Beer and Hobby Barn for sponsorship.

Sponsored by JR's Resawing and Hobby Town USA, Leonard Wyatt's Saxton AT-6 took fifth in Silver.

Left: John Krohn and Tom Pegasus obtained sponsorship from outside the R/C industry—Gordon Monument Co. and Hazpak Inc.—for their formidable array of contenders.

This Chevron-sponsored Texan was flown by Joe Reichlin of Lodi, CA.

esters had made their point.

There is general agreement among the racers that the AT-6 class should hold to a scale outline, and it is also generally agreed that the "scale outline" rule is not clearly defined in the published rules; a study is under way. It will result in a comprehensive scale standard for the Texans, and the race organizers plan to publish these standards well in advance of the '96 season. Everyone hopes that the outcome will put this matter to rest.

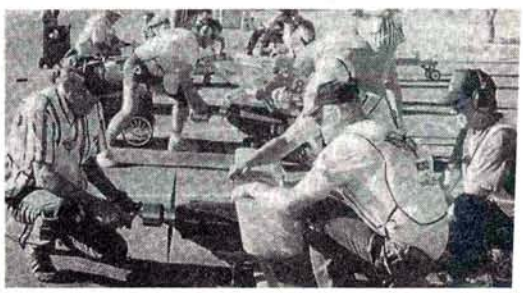
One of the stars of Madera '95 shows its stuff. The Data Logger from Aero-Sport* records engine rpm and either cylinder-head temps or exhaust-gas temps for an entire flight. Most of the winning Texans (and quite a few planes in other classes) sported the device.

Giant-scale racing has endured for five years. We've flown in scorching heat, blustery crosswinds, hail and rain. We've flown in deserts, in mountains and in valleys in California, Arizona, Texas, Iowa and Indiana. We've struggled with money, with time, with stress, with gravity and with new technologies; and throughout it all, we've returned, again and again to test our skill and push our luck on the racecourse. Will it continue? For most of us, the question has no meaning. If they build it, we will come. Why? Because, well, because *that's racing!*

This year, we have a full schedule in store, with major races slated for Galveston in April, Phoenix in May, and Madera in September. Interspersed are smaller races in Muncie and Ankeny, IA, and a new AT-6/Formula One/Biplane series of weekend races—the RMG Triple Crown—planned for Northern California, starting in February. Also in the planning stages is a world championship for Labor Day weekend in the San Francisco Bay area. If you've never attended one of these events, contact the promoters and check your calendars; you owe it to yourself to go at least once.

For more information on the Madera and Phoenix races, contact Endless Horizons at (310) 320-8369. For more information on the April Galveston races, contact Hi-G Promotions at (713) 558-4191, or (713) 879-0201. For information on the RMG Triple Crown weekend races, contact Race Marketing group at (614) 837-1309.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

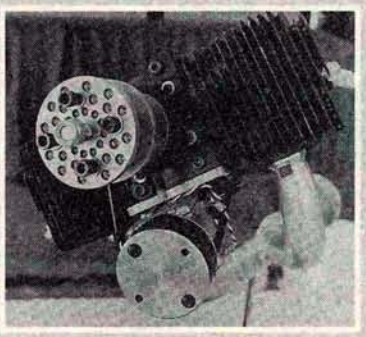


Introduced at Madera '95, the Sport Biplane class has very basic specs: 1,460 square-inch wing area; must be a scale subject from an approved GSARA list; 4.6cid engine maximum; no tuned pipes.

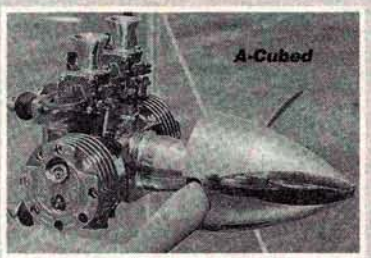
Cylinder for Cylinder... the Battle for Engine Supremacy

In the Galveston coverage, I described the A-Cubed* motor as "dominating" the event. That was a poor choice of words, because, in most applications, the Quadra-Aerrow* 200 is still the engine to beat. For your edification, what follows is a comparison of the two engines and their successes in cases where both were entered in a particular competition.

Before the A-Cubed was introduced at Galveston in 1994, the Aerrow 200 was the engine of choice for serious unlimited competitors. The A-Cubed is considerably lighter than the Aerrow 200 and it has a smaller displacement (8.8cid compared with 12cid). Thus, the A-Cubed has a place in lighter, smaller aircraft, while the Quadra-Aerrow is indicated for larger entries. Since the A-Cubed appeared on the racing scene, it has won every unlimited race in which it has been entered. On the other hand, the Quadra-Aerrow has won more trophies.



Quadra-Aerrow



Here's the breakdown:

- **Galveston '94.** Three A-Cubed engines were introduced; the fastest was in a Lancair, which self-destructed when its wings folded. The other two took first and second in Gold, while an Aerrow took fourth, took nothing in Silver, but took first, second and fifth in Bronze (unopposed by A-Cubed).
- **Madera '94.** A-Cubed took first, third and fifth in Gold, while Aerrow took second and fourth. Aerrow took fourth in Silver; A-Cubed took fifth. A-Cubed took first in Bronze; Aerrow took second and third.
- **Galveston '95.** A-Cubed took first and fifth in Gold; Aerrow took third and fourth. A-Cubed took first, third and fourth in Silver; Aerrow took second. A-Cubed took first in Bronze; Aerrow took nothing.
- **Madera '95.** A-Cubed took first and second in Gold; Aerrow took third and fifth. Aerrow took first and third in Silver; A-Cubed took second and fifth. Aerrow took first and second in Bronze; A-Cubed took nothing.

Four-race tally

- **Gold trophies.** A-Cubed: 9, including 4 firsts and 2 seconds; Quadra-Aerrow 200: 7, including no firsts and 1 second.
- **Silver trophies.** A-Cubed: 6, including 2 firsts and 1 second; Quadra Aerrow: 4, including 1 first and 1 second.
- **Bronze trophies.** A-Cubed: 2 firsts; Quadra-Aerrow: 7, including 2 firsts and 3 seconds.

Totals

- **A-Cubed**: 17 trophies (8 firsts, including 4 in Gold, 2 Silver, 2 Bronze).
- **Quadra-Aerrow**: 18 trophies (3 firsts, including 1 Silver, 2 Bronze).

What can be determined from this comparison?—only that both engines are likely to win trophies, but that historically, A-Cubed-powered aircraft have won more than two-and-a-half times as many first-place trophies than Quadra-Aerrows. Furthermore, a Quadra-Aerrow has never won the Gold when run against an A-Cubed.

What we can't tell from the statistics is the reason for these outcomes. Have more competitive Aerrow-powered aircraft crashed before the trophy races than have A-Cubed-powered aircraft? If the Aerrow-powered aircraft had remained whole, would the outcomes have been different? I have come to the conclusion that four races is not a large enough sample from which to draw a concrete conclusion, and I extend my apologies to the good folks at Quadra-Aerrow for my earlier statements. Only time will tell, but until then: go fast, and turn left!

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1996. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035.

BIRDS OF A FEATHER

Nick Ziroli Sr. (right) of Little Falls, NY, sent us this photo with his brother, Bo, of Galway, NY. After years of building from *Model Airplane News* plans, Bo finally built one of Nick's designs—the Taube. Bo's Taube is powered by a .60 2-stroke; Nick's bird is powered by a .90 4-stroke. Both 88-inch-span, 3-channel (rudder, elevator and throttle) models are covered with fabric, and they fly extremely well.

FLYING FIRST CLASS

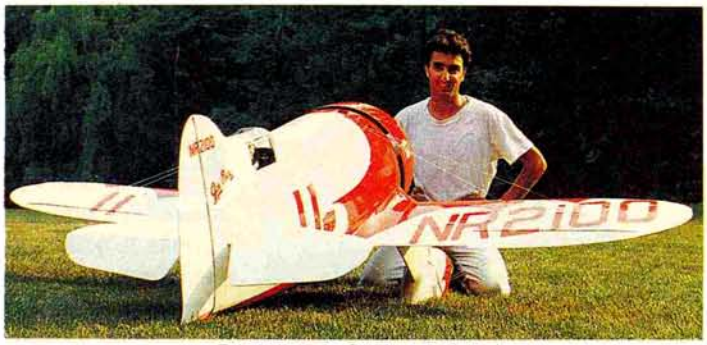
Paul Stelly of Keller, TX, scratch-built this 18-pound Douglas DC-6B from his own plans. The 90.4-inch-span, 81.7-inch-long model has a fiberglass fuse with balsa-sheeted and glassed foam-core wings. It has panel lines, upper and lower air intakes on the nacelles, internal mufflers, landing-gear parts and doors. Paul says that this giant is a little sluggish on takeoff, but it's a pleasure to fly after it reaches cruise speed.

ARIZONA X-FILES

Glynn Mount of Cornville, AZ, sent this photo of his "slightly unconventional" cross between a flying saucer and a Staggerwing Beech. By dividing the saucer in half, Glynn was able to achieve less surface turbulence. He says that the "Purple People Eater II" flies like a conventional airplane, but when it stalls, it does a back flip instead of dropping its nose. The 48-inch-span model weighs 9½ pounds and has 904 square inches of wing area.

PATRIOTIC SPECIAL

This Weeks Special belongs to Don Corbett of Oneonta, NY, who spent approximately six months building the Ace R/C kit. The 72-inch-span, balsa-and-ply model has a fiberglass cowl and wheel pants and is powered by a Zenoah G-62 swinging a 22x8 prop. The covering is MonoKote. Don says that, with a Bennett smoke system, the Weeks Special really "paints the sky at local meets."



GIANT GEE BEE

This 1/3-scale, 100-inch-span model is the handiwork of Pasha Saleh of Berkeley, CA, who built it using Henry Haffke plans. The R-1 model weighs approximately 32 pounds and is powered by a 5.6 to 6ci engine. Pasha covered it with Coverite's 21st Century Fabric and painted it with Glassurit Urethane, an automotive finish used by Porsche. The R-1 has a fiberglass cowl and wheel pants.

MICRO KADETITO

Phil Vernon of Davenport, IA, reduced the *Model Airplane News* Kadetito plan 10 percent so that the model could be powered by a Cox .05 TD engine. The 35-inch-span model uses a Futaba 4-channel AM receiver, Hitec HS-80 sub-microservos and a 270mAh battery pack. Phil used Solarfilm to create the colorful scheme.

'36 THOMPSON TROPHY CHAMP

Al Masters of Rocky River, OH, sent this photo of his 1/4-scale scratch-built French Caudron C-460. He redesigned the model for electric power from his own plans. The 68-inch-span, 9 1/4-pound Caudron is equipped with Spring-Air retracts, and it's powered by an Astro 60 on 32, 1400 SCR cells. Al tells us that it's a fine performer with the substituted NACA 4412 airfoil, open-bay construction and MonoKote cover.

FLYING TIGER

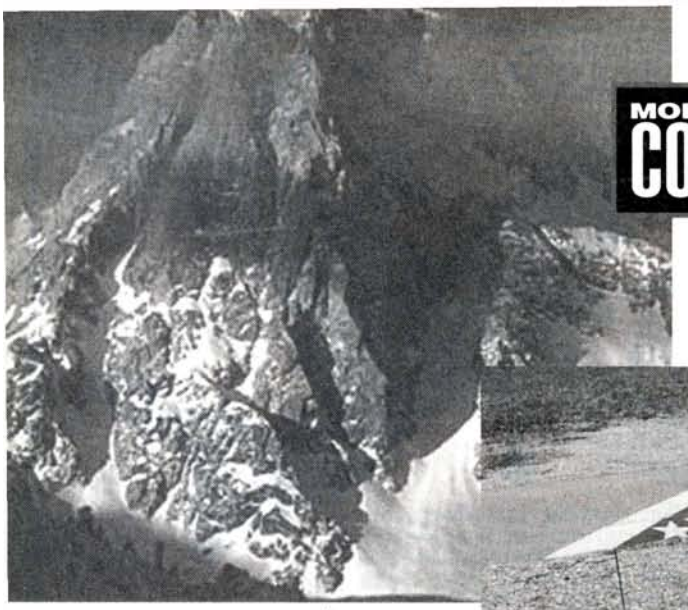
Mike McMichen of Philadelphia, PA, spent one year building this P-40E Top Flite Warhawk. It's powered by an O.S. 120 with a McDaniel glow driver for reliable low speed and Robart retracts and Sonic Tronics Hydra-Locks for realistic retract speed. Mike installed flaps, gear doors, a drop tank and a sliding canopy, and the gun sight is actually the on/off switch. The camouflage, markings and numbers were done with K&B and HobbyPoxy paint.

CLASSIC F-5

This 1/5-scale Pica Waco was built and slightly modified by John Ostmeyer of Overland Park, KS. The 72-inch-span, 13.9-pound model placed second in Static Expert class at the Mid-States Scale Classic. John covered the Waco with Super Shrink Coverite, Simm flexible automotive primer and Du Pont paint. The passenger door, front cockpit cover and battery access cover are formed of litho-plate, and an O.S. 1.60 at half throttle turning a Zinger 18-6x10 prop powers the model in a scale-like manner.

56TH FIGHTER

Dan Webb of Corpus Christi, TX, built his 1/5-scale warbird from Roy Vaillancourt P-47D plans and semi-kit. It's modeled after a full-size plane from the 56th fighter group that served in England from late 1942 until V-E Day. It has full cockpit detail (Avco kit), a scratch-built sliding canopy, sequenced main gear and doors, internal flap and aileron mechanisms and 20,000 rivets, and it's covered with 3/4-ounce glass/polyester resin and automotive paint. Dan says that the "Jug" has had 36 flights—more than nine hours in the air—and is a very scale-like flier.



A patriotic color scheme. The flags denote the countries it was flown in.

Swiss Bipe

A modern replica of an old-time performer

by HAL DEBOLT

Thirty-five years later, the Bipe and Hal at Valkyrie Field in Florida.

YOU MIGHT ASK, how come "Swiss" Bipe? What's Swiss about it? It's quite a tale. Remember that the design originated in "reed days." Those early reed systems, plus the required dry cells, were heavy. I determined that the lift needed would be more readily available from a biplane, so I used my big Custom bipe in a competition and earned a place on the first USA world championship team. To compete in Switzerland, I built a modified version of the Custom—hence, "Swiss Bipe."

The team had time to contemplate strategy and prepare for the Champs; my bipe experience was a boon to our efforts. The only problem was that I found it difficult to get consistent performance out of the K&B .45 that the big plane required. On the other hand, the ST G35 engines I had been using in other designs delivered trouble-free performance. We would be allowed only two flights in Zurich, and I knew every possible weakness had to be covered. So I solved the potential engine problem with the ST G35. Note that the ST G35, with its ringed piston, ball bearings and Bramco carburetor was probably the first modern R/C engine. It was too small for the Custom, so the basic design was downsized from 1,300 square inches to 900. Fortunately, the reduction did not adversely affect the wing loading.

For the Champs, we built two Swiss Bipes, and they performed fine. At the same time, I was flying a Playboy version of my low-wing Pursuit; low wings were just coming into vogue. We took the Bipe and the Playboy to Zurich and decided that the low wing would be more outstanding because the USA team had three of the five low-wings entered. Unfortunately, on the Playboy's first flight, a battery wire came loose, and coming out of the tail-slide maneuver, it dived into the concrete below—less than spectacular!

Obviously, I had to use the Bipe for my one remaining flight. Happily, its flight score was the second highest of the meet; it proved its worth! The original Swiss Bipe went on to have an interesting life and was flown in five countries. In 1961, it was Canada's and Japan's Nats champ. The last I knew, it was still flying in Jamestown, NY!

Besides this replica, only two of these Bipes were ever built. It was never kitted or published because "low-wing planes" had come of age. But because it is unusual and served me so well, it seems a logical choice for an OT R/C replica in these modern times. Thus, I serve it up to you.

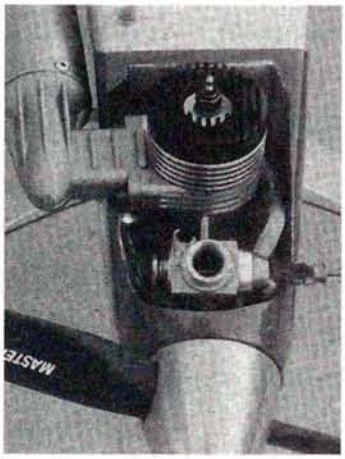
NEW AND IMPROVED

After a day of flying, I often think what a sensation it would have been to have flown this modern replica in those Champs—imagine the power and lightness! Onlookers often remark that it is more than a match for many modern pattern designs. Frankly, building it has been a most gratifying experience for me.

The replica has a light Airtronics* radio system, which weighs only 20 percent the weight of the original Bramco reed system. The Airtronics' operation has been flawless, and it is a joy to use. It

also has a Rossi* sport .40 that is about the finest engine I've ever used! It always starts with one or two flips; forget the starter! Power out the wazoo! I made my first flight with this .40 and a 11x7 .60-size prop; it sounded like a pylon racer! I progressed to a 13x7 before it calmed to respectable rpm and exceptionally low, reliable idle. Its fuel consumption is amazing—only half of what other .40s gulp! What more can be said? It's not often that we're blessed with such desirable performance.

Any pilot looking for docile flight and precise aerobatics would appreciate this Bipe. With the first reed systems, we steered with the rudder and, of course, this OT R/C responds well to that control. And rudder steering was still used even when ailerons became viable; ailerons were only used for rolling maneuvers. Perhaps that was why I was so surprised when I found that this model continues in straight flight; aileron action as it is supposed to be! Frankly, it's the first model I have ever seen that reacted to ailerons as the book says it should. Please don't ask why! But you can imagine how easily knife-edge flight is accomplished.



Compact and accessible engine cowl and compartment.

ASSEMBLY

You'll need the wings and tail when you assemble the fuselage, so it's a timesaver to attack them first. Otherwise, you won't need step-by-step instructions with plans as detailed as these. So here, I'll provide only guidelines.

• **Wings.** If you've never assembled a wing using saddle jigs, you should at least give it a try. When you build a flat-bottom wing, you put the lower-surface parts in place, and the bench top ensures alignment. Then you install all the internal structures on the lower surface, and follow that with the top sheeting, and you'll have a perfectly true wing.

The saddle jigs are also useful when the airfoil is not flat-bottom, e.g., with the fully symmetrical airfoil used here. Fastening the internal parts with CA makes it a quick process. Use aliphatic-resin glue for the top sheeting; it gives you time to position the sheeting properly. Again, you'll quickly produce a perfectly true wing.

• **Tail.** This type of structure goes back to early times when we wanted a symmetrical foil, but frowned on the effort needed to plot the ribs. The method is still viable when there are many ribs in a short span. As indicated, the fin and stabilizer are assembled using "unshaped" rib stock, and the leading and trailing edges are "centered" on the rib stock.

The first World Champs USA team (left to right): world champ Ed Kazmirski, Hal deBolt and Bob Dunham.

After the tail has been assembled, the rib shape is sanded in using a long sanding board and coarse sandpaper. The spar and leading and trailing edges serve as guides for the airfoil shape. Some call it the quick-and-dirty method, and it sure does work!

• **Fuselage.** For fitting purposes, you should choose your engine, fuel tank and R/C system before you begin assembly. The Rossi .40 was considerably heavier than the original's Super-Tigre, so for balancing, the R/C equipment had to be placed far back as shown. Your engine may be lighter; do not hesitate to install the equipment forward in the ample compartment to achieve proper balance.

There's nothing mysterious about the fuselage structure; it's simply 3/32-inch sheeting formed around bulkheads. Assembly is straightforward and alignment isn't a problem; all the bulkheads have a vertical center line. A center line is also marked on the work table and bulkhead locations are indicated on the center line. Using a tri-square, the bulkheads are positioned where required and spot-glued to the bench near their edges. "Whoa," you say! But take heart! When the fuse has been assembled, free it from the bench top by using a razor blade to break the glue joint.

With the bulkheads erected, bow the lower 3/32-inch sheeting around them and clamp it into place; use the tri-square! CA the joints, and have a solid true base on which to complete the assembly. It can be advantageous to install internal parts as you add the sheeting. Note that when the fuselage is removed from the board, the bottom is still open to allow access for pushrod installation.

• **Alignment.** You can build a plane precisely to the "nth" degree, but if alignment is off, you'll have a "dog"! It's all-important. First, check the balance; corrections are simpler to make before the model has been completed. The CG balance point shown on the plans is minus the wings for simplicity. Pile some books up with a 1/4 inch square on top. Place the fuselage on the 1/4 inch square, and adjust until it rocks equally fore and aft. Balance is safe within 1/2 inch of the point shown.

Next, check the incidence angles of the tail and the wing. The lower edge of the fuselage makes a usable reference line. From this line, a line can be scribed on the fuselage sides; adjust the wing saddles if correction is required.

Surface attachment requires alignment

Model name: Swiss Bipe

Type: sport/pattern bipe

SPECIFICATIONS

Wingspans: 53 in. (top), 38 in. (bottom)

Wing area: 887 sq. in.

Wing loading: 12.3 oz./sq. ft.

Length: 45 in.

Airfoil: symmetrical

Weight: 4 3/4 lb.

Radio req'd: 4-channel

Radio used: 6-channel Airtronics

Engine req'd: .35 to .40

Engine used: Rossi .40.

Comments: this classic bipe, never before published, uses modern equipment but still maintains its sense of being an old-timer. Construction includes the basic formers and sides for the fuse and the standard ribs, spars and sheeting for the wings. The airframe is balsa and ply—very light; and it flies exceptionally well.

also. Position the wings using the leading-edge dowels. Then measure from the rudder post to each trailing edge tip, and make sure the distance is the same on each side. Then drill the attachment-screw hole into the fuselage mount.

Center the horizontal tail on its mount, and install the forward attachment screw. Install a straight pin on the center line of the landing gear bulkhead. Measure from the pin to the stab tip hinge line, and equalize the distance between the two tips to the pin. Then drill, and install the rear attachment screw.

For further alignment, place the fuselage on a flat table top. Then install the top wing, and measure from each wing tip to the table top. The two distances should be equal; if not, adjust the saddle; do the same for the bottom wing and stabilizer.

If the stab were tilted, the model would turn toward the high side. When the struts have been installed, be sure they are "snug," but don't alter the wing alignment. When you are satisfied, step back about 15 feet and "eyeball" the alignment; it should also "look right"!

Though it is rock-steady in flight, this Bipe is sensitive to control movements for three reasons: it's lightweight, it has a low wing loading, and it has large control-surfaces. So don't rely on experience; set the movements as follows:

- ailerons—½ inch total travel;
- elevator—¾ inch total;
- rudder—1½ inches total.

COVERING AND FINISHING

By far the most durable fuselage finish is fiberglass; ¾-ounce cloth, applied with epoxy resin, is heavy enough. A second coat of resin (sand it well), and a coat of filler prepares it for paint. Use your favorite brand; the Swiss Bipe was patriotic with its red-white-and-blue scheme.

The high-mounted servos in the replica might account for its abnormal aileron action. The plans show original location as well.

Plastic film serves well for the wings and tail. The original used colored silk and Aero Gloss* dope. Coverite's* "Black Baron" film is easy to apply and, after it has been shrunk, it seems to stay tight for eternity. Nice stuff; I highly recommend it!

FLYING

You've made several preflight checks? Servos operate freely? Right is right, up is up, etc.? Engine starts easily, high speed is steady, idle is low and reliable? Batteries fully charged? If so, nothing is left but to tear up some sky!

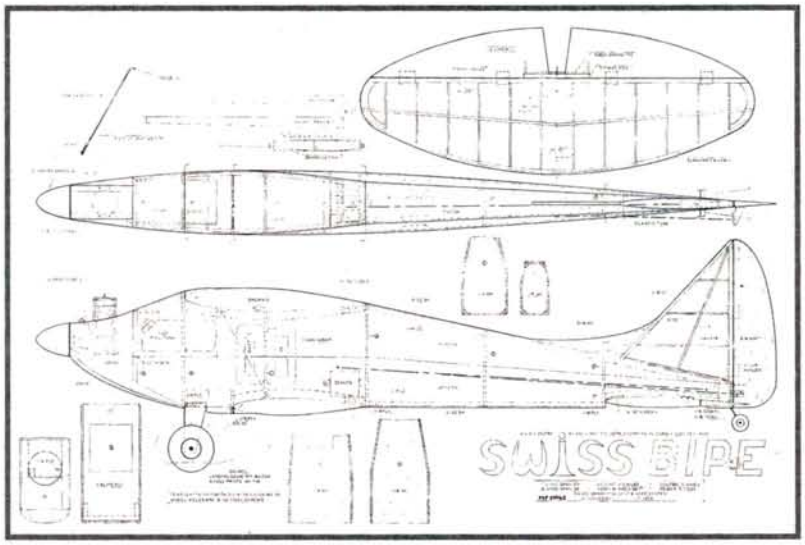
If you are an accomplished pilot, there's nothing special about the Swiss Bipe that you need to know. Normal flight is as you'd expect. No maneuvers should exceed its capability, but remember it *is* an OT R/C.

Because it can be awkward to steer with rudder when you are accustomed to ailerons and the aileron stick, I find it more comfortable (these days!) to use coupled rudder and aileron. This does not detract from the performance. With my Airtronics system, simply flipping a switch decouples the rudder and ailerons when axial rolls and knife-edge are desired.

CONCLUSION

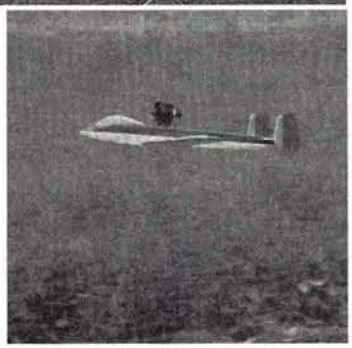
First, know that the Swiss Bipe is eligible for the Senior Pilot Association competition. I was happy that the replica duplicates the original's performance at about ½ power and goes like a modern plane when more power is added, though I seldom fly it with full power! It's nice to have two in one—OT R/C and modern capability! This one-of-a-kind OT R/C is unusual and just might suit you to a "T." Good luck!

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.*



ORDER THE FULL-SIZE PLAN...SEE PILOTS' MART.

The big increase this year had to be in the number of ducted-fan models that flew; in past years, many took ducted fans to the meet but didn't fly them. Larger ducted fans are also growing more popular.



Tom Hunt's highly modified 59-ounce Jetster; Electrojet Cobalt model fan; Graupner Ultra 930 motor; 14, 1400mAh cells; 3.5-inch-diameter fan rotor designed by Bob Kress. Drawing 35 amps static, this combination really moves this plane; wing modified to have a thinner airfoil; 400 square inches. Tom's company, ModelAir-Tech, has plans for a similar forward-swept wing design—the JetStar.

Larry Sribnic had moved the event to larger quarters, yet still filled the place. Keep growing, Larry. After the symposium, most of us went over to the Buc-Le Aero-sportsmen's Field—the site of the fun fly.

AFTER DARK

After the sun had set, the field took on an eerie glow because of the chemical light sticks that had been set up along the runway as night-landing aids.

About 10 modelers had specially made lighting systems on their planes, so they could see them in the air after dark; this seemed to be the best method of illumination. SR Batteries also supplied light sticks free to anyone who wanted to try this unique form of flying. After seeing planes with a redesigned lighting system, however, I would say that chemical light is a last resort. Andy Clancy of Clancy Aviation* had a Lazy Bee with colored lights in each wing bay. He used three sets of RAm* Skylights to illuminate his planes; this system is perfect for this application—very pretty!

present, too. Every one of Andy Clancy's planes looked as if it would be fun to fly. Andy is the designer of the Lazy Bee, which is one of the most popular kits on the market. Andy also had several other planes, including a ¼-scale—the Stitts Sky Baby biplane—that would almost fit in a car's glove compartment. The 26-inch-span model is a scale version of the world's smallest pilot-carrying aircraft. It flew surprisingly well, despite its bulbous fuselage.

Ken Stinson had one of the most unusual *avions* at the meet—a full-scale model of a turkey vulture. Called the "Volture," it was modeled after a bird that flies in his neighborhood. John Chapis of Chapis Plans* also had a few neat planes on hand; I was particularly taken with his skinny scale Sukhoi for geared 15 to 25-size motors. This plane looks like a Sukhoi from every angle except nose-on. John makes a simple box fuselage instead of the complex curved fuselage. In the air, the difference is negligible. I want one!

David "Turbo" Dantonio's scratch-built Electrojet twin—one of the KRC's most spectacular planes; 5¾ pounds; 54-inch span; 530 square inches; two Model Electronics Products War emergency motors; 3.8:1 gearboxes; 9x7 props; 16 cells; Astro 205 controller; 8- to 10-minute flights; weight didn't inhibit performance.

SOMETHING FOR EVERYONE

What impresses me the most about the models at KRC is that there is no limit to the types of aircraft modeled. There were seaplanes, jets, military transports, animals, Schneider Cup racers, pylon racers, Wakefields, micro aircraft, giant-scale and sport-scale.

There were quite a few "fun planes"

MICRO JETS

At least three Electro Screamers flew. The Screamer is a Speed 400-size ducted fan designed by Don Belfort around the Hiline Blue Flame Blaster ducted-fan unit. This plane has to be the least expensive way to get aerobatic performance from a ducted fan.

Andy Clancy had a 32-inch-span McDonald XF-85 Goblin with a Blue Flame Blaster. The Goblin has flown, but needs a bungee to launch it up to flying speed.

Russ Pribanic scaled down a Diamond Dust Delta and put a jet tube containing a Blue Flame Blaster through its middle. Russ also swapped the supplied motor for a Kyosho* AP 29, and he upped the cell count to eight. This one flew, but landings needed work.

I see the micro-jet class as the fastest growing segment of the electric ducted-fan market because they cost less to build, are low maintenance and easy to transport. New fans are entering the market regularly.

Kurt Grosse of ElectroJet Technologies* recently introduced a speed 400 fan unit that can accept the Kyosho AP-29. This unit takes about 5 minutes to assemble, and it produces approximately 240 grams of static thrust on a Speed 400 6V motor on 7 cells. I don't have the thrust figures on the AP-29, but they should be substantially more.

HEAVY METAL

The big increase this year had to be in the number of ducted-fan models that flew; in past years, many took ducted fans to the meet but didn't fly them. Larger ducted fans are also growing more popular.

Bob Kress* and Kurt Grosse (ElectroJet Technologies) are working together to produce fans for both the U.S. and the European markets. Kurt exports his fan rotor from England to the U.S. for Kress, and he imports Kress fan units for ElectroJet. Both companies make their own version of fans based on the other's rotor. This gives modelers access to several types of fan and allows them to choose the unit that best fits their installation. (See the sidebar, "Electric Mall" for details on these units.)

KRC ELECTRIC FLY

Nick Ziroli* used the Kress/ElectroJet 3.3-inch fan unit with 15, 1000mAh cells to power his Heinkel. Nick scratch-built this plane and gets about 4 minutes of flight. The plane loops and rolls from level flight and is quite fast. Nick plans to kit this plane soon, and it will be featured as a *Model Airplane News* construction article.

Tom Hunt removed the Kress fan unit to test the new ElectroJet Cobalt unit, which uses a 7-blade Kress impeller (are you confused yet?). This 3.5-inch unit uses a Graupner* Ultra 930-6 motor on 14, 1400mAh cells, and it draws 35 amps static at approximately 19,000rpm. The performance increased, but the flight time went down slightly.

Nick Ziroli's Heinkel ducted fan takes to the skies. Watch for this one as a Model Airplane News construction article.

TASK-SPECIFIC DESIGNS

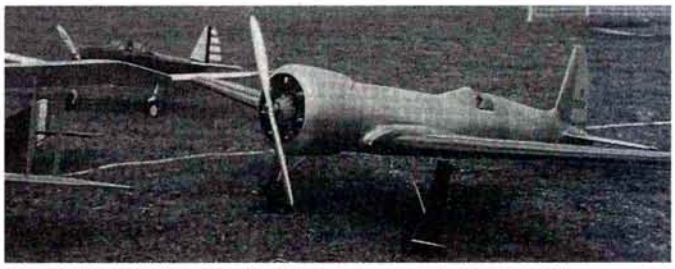
The number of aircraft designed specifically to do *one thing well* has increased steadily. At the meet, there were duration planes, pylon-racing planes, F5 planes and even solar-powered planes.

Every year, the winning time in the All Up, Last Down event climbs steadily higher. Specifically for this event, many people have designed planes with motors that can run for more than an hour on a single charge; in fact, the event now takes so long to complete that it severely drains the flight times of other participants. This time, All Up was won by Brad Baylor, who used batteries with rather large capacities and an Aveox* motor. It's interesting that Brad said he had enough power left for about 45 minutes more run time.

F5 planes are the ultimate in power trips, but those with a need for speed may have to mortgage their house for one of these monster planes. The number of people who fly these planes competitively is small, but many now fly them as sport pattern ships. They're capable of nearly unlimited vertical and are generally out of sight in less than 10 seconds. Whoa...!

Micro pylon racing is just beginning to take hold here in the U.S., and there were five such racers at the meet. In Germany, it's the fastest growing electric event because it doesn't cost much to get going.

Several times during the weekend, Chris True flew a 117.5-ounce Graupner Mini Viper racer. It's powered by a Speed 400 6V motor on 7, KR-1000 AE cells, a Futaba speed-control receiver and S133 servos. Chris says Speed 400 pylon models are a lot of fun for the buck. Tom Hunt had a ModelAir-Tech SSP 400, and



Dave Grife (Michigan) built this fabulous scale Hughes H1 racer and took home first-place scale honors.

ELECTRIC MALL

• **Tom Cimato of MaxCim* Motors**—a newcomer to the field of brushless electric motors—demonstrated his new Max 15 motor and digital speed controls. The Max 15 with the Max Micro 30 speed control can produce power from 05 to 40 geared size. This combination can handle six to 25 cells; simply adjust the gearing or prop to control the current used. The Max 15 also works well with the Model Electronics gearbox. List price for motor and controller—$299.95.

• **Jarvis Yeh of Cermark*** showed me his new CEM 15, 10-cell FAI motor., which features highly machined end bells and a brush housing that is nearly flush with the diameter of the motor.

Cermark also recently released the Islander—an ARF twin that features all-balsa construction, Ultracote covering, painted fiberglass cowls and nacelles and uses two 05 motors. The next ARF in the pipeline will be a Porterfield Collegiate (to be released for spring). Cermark no longer offers the ARF Playboy we mentioned last year.

Cermark also now carries a synthesized, transmitter frequency module from Hitec. The unit can be set to any of the currently available frequencies and is compatible with Hitec and Futaba receivers.

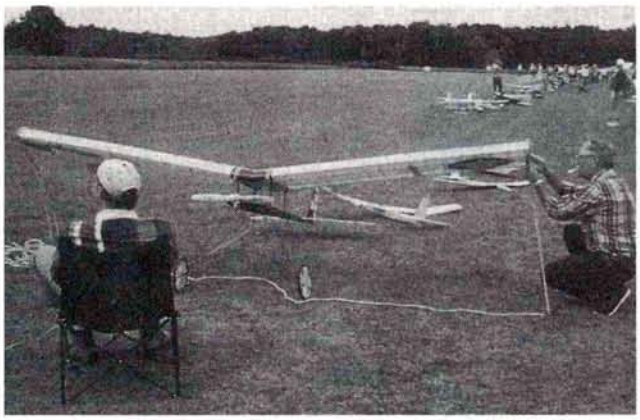
• Use the Sticka vinyl-cutting machine to make graphics for airplanes and signs. Portable and compatible with Windows, it includes a software manual and two, 10-foot rolls of vinyl and transfer tape. It will produce graphics up to 2 7/8 inches wide in eight colors. IBM and Mac versions are available for $288 through OME Worldwide*.

• **Martin Euredjian of AI/Robotics***—maker of the FX–35D digital speed control—announced a new series of motor controllers. They plan to introduce eight controllers for a variety of applications (four for competition), and there's also a Speed 400 class controller. All will feature sequential arming systems and will be digitally controlled.

• **David Palombo of Aveox** showed me the new motor system the F5 team will use in the world championships. The F5 team used the 18/17 motor with a new speed control, and they're now experi-

there were also three Rockets that belonged to Doug Dorsey, Don Belfort and me. Unfortunately, we weren't able to get everyone together to fly a few laps.

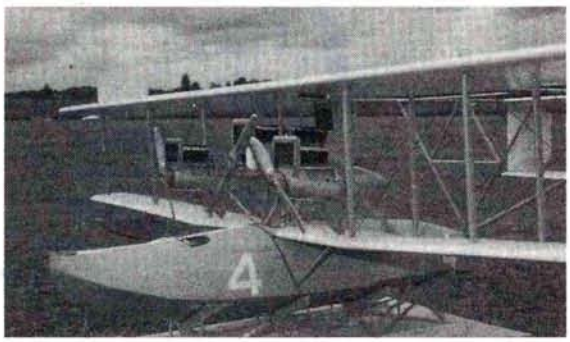
I just completed a newly redesigned Rocket for KRC. The changes included a slightly longer wingspan and tail, and they seemed to do the trick, because this normally twitchy plane is now a pleasure to fly. Since KRC, I have flown it numerous times, and it really grooves. The Rocket is my first attempt at kitting an airplane.



Jesse Burgin's 236-inch monster Flying Ace Stick was the largest plane at the fun fly.

Doug Ingraham of Lofty Pursuits* got me a sample of his new LPSC Mini speed control for Speed 400 motors to try in my Rocket. The controller weighs 18 grams and can handle up to 15 amps with six through 10 cells. It's a high rate controller with soft start, safety start, low-voltage cutoff and lost-signal shutdown.

Every year at KRC, Keith Shaw gives a solo demonstration of his fleet. Noted for his great building and flying skills, Keith is truly one of the pioneers in electric flight. His 30-minute demo is a real crowd-pleaser, and it also allows the organizers of the fly-in time to gather the frequency pins for the All Up, Last Down.



The first aircraft to fly across the Atlantic Ocean was the Navy Curtiss 4 in May 1919. Ready just in time for KRC, Don Bousquet (Naragansett, RI) built his from Cleveland plans; 4 pounds, 2 ounces; 62-inch-span wing has 283+ rib pieces by Paul Anderson (Wyoming, RI); four Speed 400 4.8V motors; handmade props; 16,650mAh SR Max cells; FX35 digital speed control; Airtronics radio.

THE DAY THAT WASN'T

It began to rain at about 9 p.m. on Saturday, and it did not stop until about 11 a.m. on Sunday. The parking lot soon became a muddy mess, and it was decided that, rather than damage the grass any further, the Fun Fly would be ended.

By the end of the meet on Saturday, 178 people had registered to fly—more than the total attendance for both days last year. Generally, the number of fliers increases on Sunday, so who knows what the final figures would have been, if it weren't for the rain?

Many folks took the opportunity to get in a few last flights before heading for home. My 6-year-old daughter, Danielle, and I used the time to pick out her first airplane kit. I hope to have both Danielle and her plane with me at the next KRC Electric Fly.

If you would like to drop me a line, e-mail me at Griggsbill@aol.com or [102341,2605] on Compuserve.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

menting with a smaller motor—the 1412 2Y—with a Robbe planetary gearbox. Aveox developed a technology that allows them to run the magnet rotor at more than 80,000rpm. This allows them to run a smaller motor at higher rpm and to gear the motors down to swing a 12x6 prop at 14,500rpm. With this setup, they require only about a 4.5-second motor run to get up to spec height (they climb at 120 feet per second). Aveox has entered a joint venture with Robbe and uses the Robbe Planetary gearboxes and the Aveox motors. The Italian, German, Austrian, Swiss, Dutch, French and American teams all have tentative plans to use these motors for the next world championship.

• **Tom Hunt's company—ModelAir-Tech**—makes belt-drive units for large motors. The H1000DP (DP refers to "dual parallel") can be used to connect two motors on a single unit to drive a single shaft. The unit can handle well over 1000 watts, can be run on Speed 700 motors and Astro 40s. Several gear ratios are available, including 2.57:1, 3:1, 3.6:1 and any ratio in between (as a special order). Use the unit to fly any plane designed for Astro 40 to 60 motors (depending on how many cells are used).

The single unit with the 24-inch prop is a special H1000 designed to handle Astro 60 to 90 motors. It has a 3/8-inch shaft and special pulleys and belts to handle the high output and was designed for 1/4-scale planes weighing between 15 and 20 pounds.

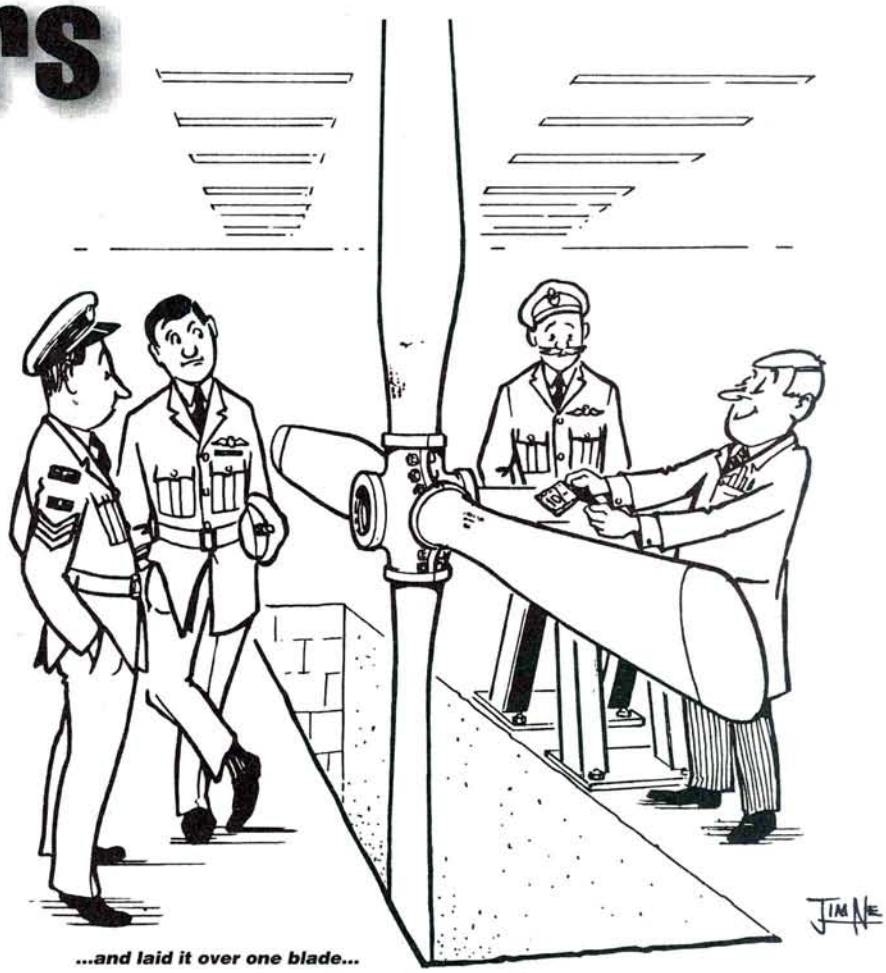
• **Phil Thayer of Flightec*** flew a hot Sig TriStar canard designed by Leroy Satterly. It was powered by an Astro FAI 15 motor that had been lightened by Kurt Massey. On eight cells with an 8x4 Graupner slim prop, the model ate up the sky. A Flightec SEC-SP speed control with a BEC controls this 3-pound plane.

Flightec's new SEC-SP and SEC-M speed controls have several safety features, including power-on delay and automatic calibration. New, low-resistance FETs allow several performance increases. The SEC–M is for six to 20 cells, while the SEC-SP will handle six to 16 cells.

Propellers

Text and Illustrations by JIM NEWMAN

An informative and lighthearted look at an often misunderstood subject



...and laid it over one blade...

LIKE MOST MODELERS, the care and feeding of propellers was never high on my priority list. I did as everyone else did: I walked into the hobby shop, handed over my coin of the realm to Swindon's dear old Jim Cavanagh and walked out with my wooden propeller clutched in my grubby little fist. That propeller was promptly attached to my greasy diesel engine and flown at the first opportunity. The only propellers I ever finished and balanced were those on my rubber-powered models, and that only came about because, when I started modeling, we all made our own propellers. Ready-made propellers just did not exist.

PROPER PROPS

Some years later, a couple of events took place that really brought home to me the importance of balancing propellers. The first occasion was when I was in the Royal Air Force. We were just in the process of accepting the very elegant Bristol Britannia airliner into service when the propeller manufacturer offered us the opportunity of seeing how our propellers were made. I suppose this was to establish consumer confidence in the product and, in retrospect, it was pleasant to sit between those four big Bristol Proteus turboprops feeling fairly comfortable in the knowledge that the airscrews (the term of that era) were not suffering from metal worm and were unlikely to depart for places distant.

The folks behind had decided to go their own sweet way...

During our walk-through of the shops, we were taken to see one of our propellers in the balancing stand which, because of its size, was half in a big trench dug out of the shop floor. The "boffin," as technicians were then known, was nattily attired in the obligatory long white laboratory coat with dress slide-rule-and-penc in the top pocket, and he droned on at leng about the standards to which they balanc their beautiful, hollow aluminum propelle and all the reasons why they went to suc trouble, not the least of which was so tl poor propeller shaft wouldn't give up tl ghost at 30,000 feet—no argument from n or the rest of the crew on that one! The id of our fuselage being treated as a giant sal mi by an errant propeller wasn't one any us relished; besides, it would create a ho rendous draft for those sitting in the bac not to mention consternation among tho of us up front who suddenly discovered th the folks at the rear had decided to go the own sweet way.

To emphasize his point, our mentor pr duced a 10-bob note (10 shillings) from h pocket, snapped it taut between the finge of both hands and brandished it around c high for all to see. He then creased the no across the middle and laid it over one blad causing that huge propeller to dutifully an gracefully rotate in the jig while our tan boffin, who was now smugly smiling a round, quite forgot about that sizable portic

of his pay that promptly slithered off the now sloping blade and fluttered about 12 feet into the bottom of the pit!

Anyway, the point about delicate balance was not lost on us, and we departed for our base, secure in the knowledge that 10 bob will cause a propeller of humongous proportions to rotate, which, no doubt, would give us all renewed confidence the next time we were crossing the Med en route for Aden.

Some years later, I had the opportunity to put in quite a few hours in a motor glider. Apart from the fact that wisdom dictated the wearing of ear plugs (noise was a characteristic of the machine) was that everything, but everything, vibrated enough to rattle the change in one's pocket and the fillings in the teeth to boot.

However, in a real rash of enthusiasm one weekend, markedly hastened by the sight of the glass covering separating from the blades, I removed the propeller and set about refinishing it. In short, the propeller was completely stripped and airfoil templates made of each blade and then compared. It was with some surprise that I found, on comparing the templates, that the airfoil of one blade was quite different in shape and thickness from its mate on the opposite side of the hub! Having persuaded the two blades into some semblance of likeness, I reglassed, primed, then sprayed them with HobbyPoxy* silver.

At every step of the way, from the moment I started correcting the airfoil sections, I took great care to keep the propeller in balance so that I would not have a massive balancing operation on completion—an action that saved a lot of grief and hard work in the end. Balancing was done on a pinpoint balancing device made by a local machinist. Glued to the top of the balancer was a bull's-eye bubble level that made it extremely simple to detect which blade and which edge of the propeller was heavy. "Which edge?" you ask incredulously? Read on!

...Everything—but everything!—vibrated.

Anyway! The upshot was that after reinstalling the propeller on the airplane and carefully tracking it, i.e., ensuring that one propeller tip faithfully followed in exactly the same path as the other, I found that the engine gave 200 more rpm on takeoff and would easily exceed the tachometer red line if I did not keep an attentive eye on it.

In short, the propeller had now gained so much efficiency that it could have done with a couple of inches more in pitch, and we would have benefited from a higher cruise speed. Obviously, not all of that gain came from the balancing, but it does give you some idea. The other major benefit was that the airplane seemed to be 50 percent quieter in the cockpit. The instrument needles and the panel, too, placidly remained where they should be; the tingle in my feet from the resonating rudder pedals subsided; and the canopy no longer rattled like a jack hammer. The fillings also remained in my teeth so that my dentist no longer got rich at my expense.

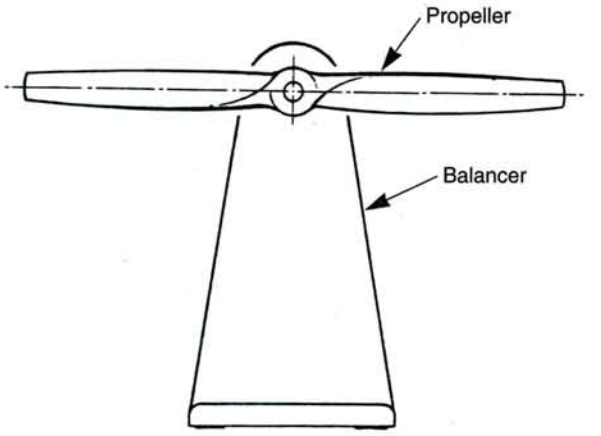


Figure 1. Horizontal balance; prop is only 50 percent balanced.

BALANCE FOR MODELERS

With the advent of super-efficient model-size propeller balancers, it is now possible to balance props easily. My balancer is one of the original beautifully made High Point devices now available from Robart*. Another good balancer, I would imagine (I haven't used one), is the magnetic balancer from Top Flite*. With this tool, I just can not see how there can be any significant friction, because one end of the pointed spindle rests against a powerful magnet while the other waves around in midair!

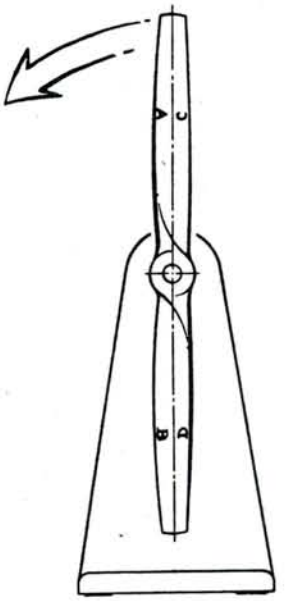


Figure 2. If a vertical prop acts as indicated, edge "A" is heavy.

With the propeller mounted on the spindle of the balancer, it will probably rest more or less horizontal. My good friend Bill called me into his shop one day and proudly showed me how his propeller rested neatly horizontal across the balancer as in Figure 1. He spent a long time on that, he said, so I just hated to burst his bubble. "Sorry, Bill," I said, as gently as I could, "but it is only about 50-percent balanced. If that propeller stops horizontal, with the same edge of the blades downward every time, then the bottom edges are heavy. A balanced propeller should stop and remain anywhere on the cir-

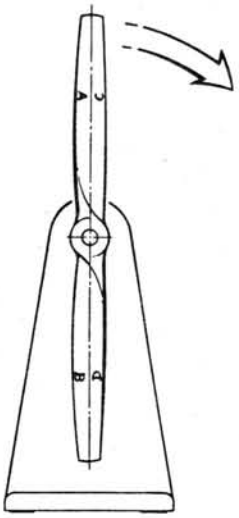


Figure 3. If the prop rotates clockwise, edge "C" is heavy.

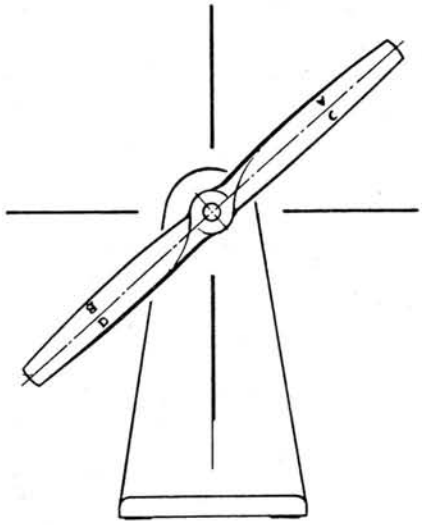


Figure 4. Here, edge "D" is still heavy.

cle without any tendency to rotate at all." In this particular instance, both of the lower edges were heavy and should have been sanded on their aft faces; the propeller should have been given trial swings every now and again to see where it came to rest.

It helps considerably to take a Sharpie pen and mark the leading and trailing edges of the blades A, B, C and D. Having done that, set the propeller vertical on the balancer as in Figure 2. If the blade A-C falls counterclockwise for example, then edge A is the heavy one and should be sanded on its aft face. Similarly, if the propeller rotates clockwise as in Figure 3, you can assume that edge C is heavy and it, too, should be sanded on its aft face.

Eventually, you will reach the situation shown in Figure 4 where the propeller stops diagonally. In this instance, edge D consistently stops in the lower left quadrant, so it should be lightly sanded on the aft face then given a few trial spins to see if there is a consistent pattern in its resting place. If it persistently stops with edge B in the lower right quadrant (Figure 5), then the aft face of B should be sanded and the trial spins repeated.

Once the propeller reaches the fully statically balanced state, it will be found that the blades have no consistent resting pattern; the propeller will stop randomly at points all around the circle (Figure 6).

Now you can apply protective coats of urethane varnish or epoxy, checking the balance again after the finish has fully set. In most cases, a few strokes of fine sandpaper will restore the balance. More often than not, a spot or two of the finish at the end or the appropriate edge of one blade will accomplish the same thing and, if you are balancing two or three propellers, it is amazing how fast you can do it, because most propellers leave the factory pretty well in balance.

Molded, glass-reinforced nylon propellers can be treated in the same way as wooden ones, except that a good buffing is all that is required to restore the gloss after sanding, and for this, a regular metal polish on a soft cloth works wonders.

VISIBILITY AND SAFETY

I once saw a picture of the front of a model with a large circular-saw blade bolted to the propeller shaft! I thought that was a very clever and highly effective statement on how propellers should be viewed. I get the impression that, since the advent of those razor-sharp, reinforced-nylon propellers, hand injuries have become more horrific, therefore, the need for total concentration when going through the starting and launching procedure is mandatory. I will not dwell on the handling aspects—it has been done many times elsewhere—but I will offer suggestions on propeller visibility while the engine is running.

In full-size aviation, you will notice that propeller tips are painted bright yellow. Occasionally, you will see white propeller tips, and you could not do better than imitate full-size practice and paint the end $\frac{5}{8}$ inch (16mm) of each blade tip yellow or white; this shows up as a yellow or white circle while the propeller is spinning, thus defining the outer perimeter of the propeller arc. Naturally, if you are in the habit of reaching through the propeller arc for the needle valve, then I would say that you are beyond help!

Some time ago, following the introduction of turbine-powered aircraft into its inventory, the Royal Air Force carried out extensive research into propeller visibility. Turboprop aircraft have their own unique problem for ground crews. The engine is operating at 90 percent of its power all the time, and thrust is varied by changing the pitch of the propeller. Consequently, that propeller is spinning at very high rpm while the aircraft is on the ground, and the propeller disk is all but invisible.

To compound the problem, from certain angles, the power unit is extremely quiet, and only when one is edge-on to the propeller disk does one hear the characteristic roar off the tips and from the residual thrust of the turbine exhaust. By then, it is too late for any daydreaming, wandering soul....

In an effort to reduce the number of sliced, diced and chipped mechanics, the RAF evolved highly effective propeller markings that comprised a series of red and white stripes (mostly of equal width) across

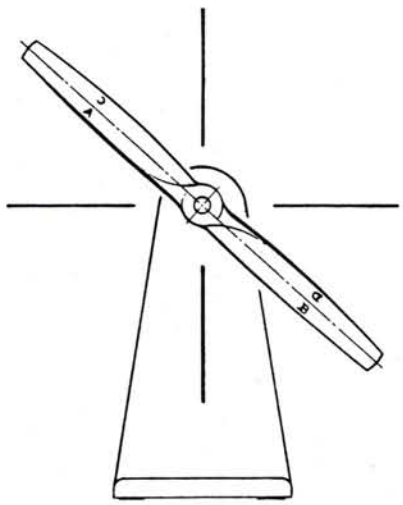


Figure 5. Here, edge "B" needs to be sanded.

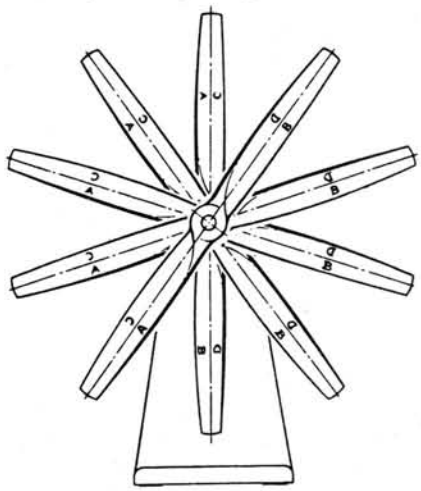
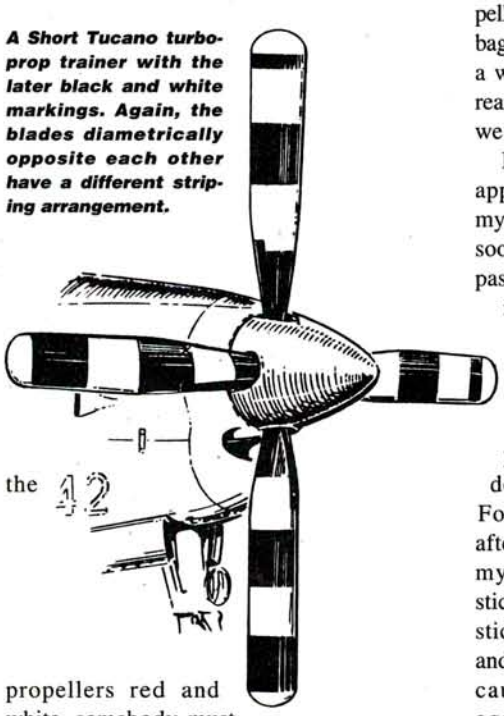


Figure 6. When properly balanced, a prop will come to rest at random positions.

the blades' forward faces (somewhat jarring on the senses of we old-fashioned traditionalists who prefer our propellers to look like propellers, and on a model it would be eye-catching). The net effect was that, when the engine was running, one saw a highly obvious pattern of red and white concentric circles with the outermost circle, i.e., the propeller tips, in white.

One can always tell when things are a little slow in the halls of the Ministry of Defense (Air) in London; that's when they refill the old teapot, then sit around the table and decide to make sweeping changes in Colors and Markings—presumably to give the lads something to do when the weather is bad and there's no flying going on! Sure enough, after painting all



A Short Tucano turboprop trainer with the later black and white markings. Again, the blades diametrically opposite each other have a different striping arrangement.

the 42 propellers red and white, somebody must have got a good deal on black paint at Woolworth's, because the red and white stripes suddenly became black and white! On the other hand, it's likely that one of the committee threw a fit because he obviously still had some red paint left over somewhere, and to appease him, some aircraft now have their propeller tips painted in two red stripes with a broad white one in between...! The illustrations on this page show the progression of their lordship's deliberations over tea and crumpets.

GROUND SAFETY

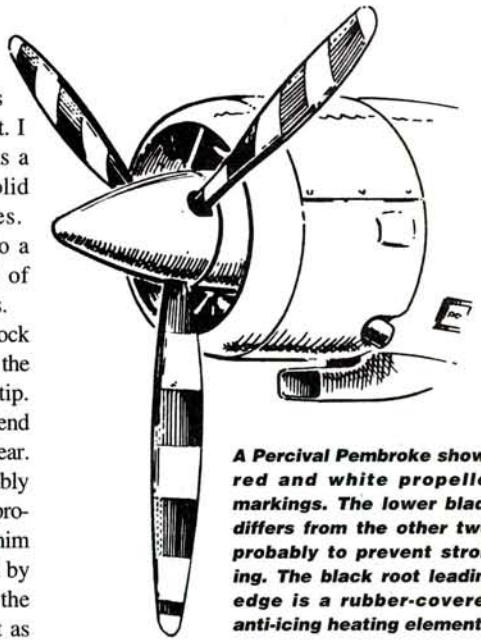
When starting and running any model, use a chock; I can't recommend this too highly. For several years, I have used a 1½x20-inch (38x510mm) chock (Figure 7). Actually, 2 inches (50mm) tall would be better, but I used the material I had to hand at the time. A 60-inch (152cm) light rope is attached to one end, and the chock is painted with bright yellow urethane paint. I have a Shopsmith® table saw, so it was a simple matter to rip a chock out of solid stock with the table set at 50 degrees. However, if you do not have access to a table saw, you can make a chock out of lengths of flat lumber with triangular ends.

Before starting your engine, put the chock in front of the aircraft's main wheels, with the rope laid out toward a convenient wingtip. When I'm ready to taxi away, I grasp the end of the rope and smoothly pull the chock clear. *Do not jerk it away;* you could conceivably snag the grass and flip the chock into the propeller arc. For engine runs, I use two denim bags filled with old nuts and bolts joined by a webbing strap. This strap lies across the rear fuselage to keep the tail down (just as we did when running-up Spitfires).

I felt a little self-conscious when I first appeared at the Sundowner's field with my chock, but a few favorable comments soon dispelled my embarrassment. In the past 10 years, it has saved me from serious injury only once; so as far as I am concerned, it has paid for itself handsomely and has been worth the effort of always installing it immediately after parking. What happened? Oh, you must have seen it at your field a dozen times. Kneeling in front of my Fox .60-powered Telemaster, after starting up, I stretched out my hand to bring the throttle stick back. Instead, I brushed the stick with the back of my hand and knocked it almost wide open, causing the aircraft to lunge against the chock where it stopped and prevented my knees and thighs from being seriously lacerated. Yes! I *do* move to the rear of the aircraft before touching the needle—*always*. As a freelance illustrator and draftsman, I am extremely conscious of the fact that if I damage my hands, we don't eat.

DON'T MODIFY PROPS!

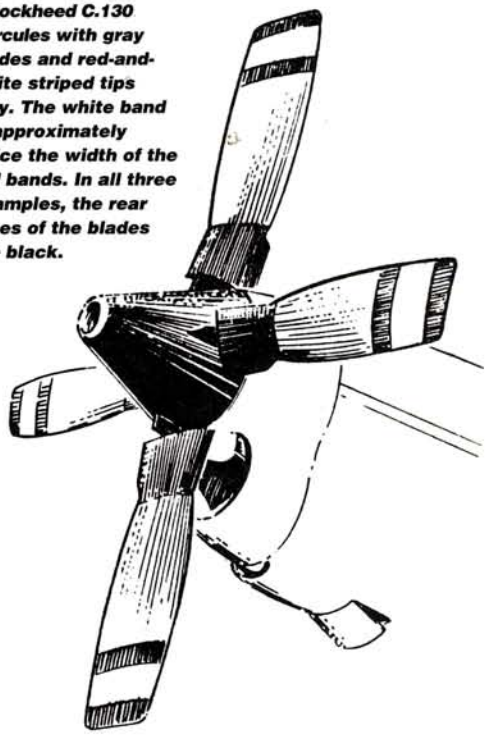
From time to time, we see articles on how to modify propellers to create a four-bladed version. Do not do this for a flying propeller! Sawing halfway through the hubs of two propellers to create a lap joint (as I saw in one magazine) is



A Percival Pembroke shows red and white propeller markings. The lower blade differs from the other two, probably to prevent strobing. The black root leading edge is a rubber-covered anti-icing heating element.

not the way to do it. The stresses on the propeller hub (in particular, the tensile loads) are tremendous.

In general, *don't do anything to propeller hubs* other than carefully smoothing them with fine sandpaper. The propeller drive washers fitted to some larger engines have two protruding pegs that require that the hubs be drilled to accept the pegs. The recommendation of knowledgeable people is that you remove the pegs. Propellers are meant to be driven by the friction between



A Lockheed C.130 Hercules with gray blades and red-and-white striped tips only. The white band is approximately twice the width of the red bands. In all three examples, the rear faces of the blades are black.

PROPELLERS

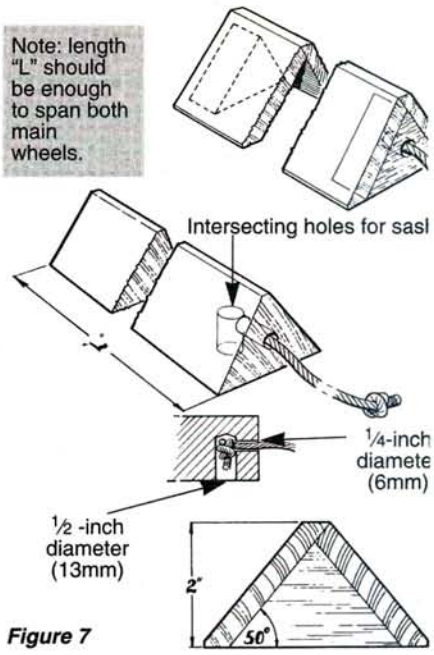


Figure 7

the propeller hub and the drive washer, and if you have a propeller that persistently slips, the best remedy is to cut washers out of 400-grit sandpaper and use CA to glue them back to back—grit side out, of course. Slip this washer onto the shaft before you install the propeller, and it will eliminate all slippage. Drilling holes to accept those pegs will increase the risk of splitting propellers end to end and throwing the blades, and we've had a couple of documented cases of that recently.

When tightening the shaft nut on a wooden propeller, do not tighten it so much that the wood is crushed, because this damages the propeller and creates stress risers. You will also find that, having been crushed once, the propeller will soon need its nut tightened again...and again...and again. Use the old sandpaper trick and a self-locking nut on the engine shaft.

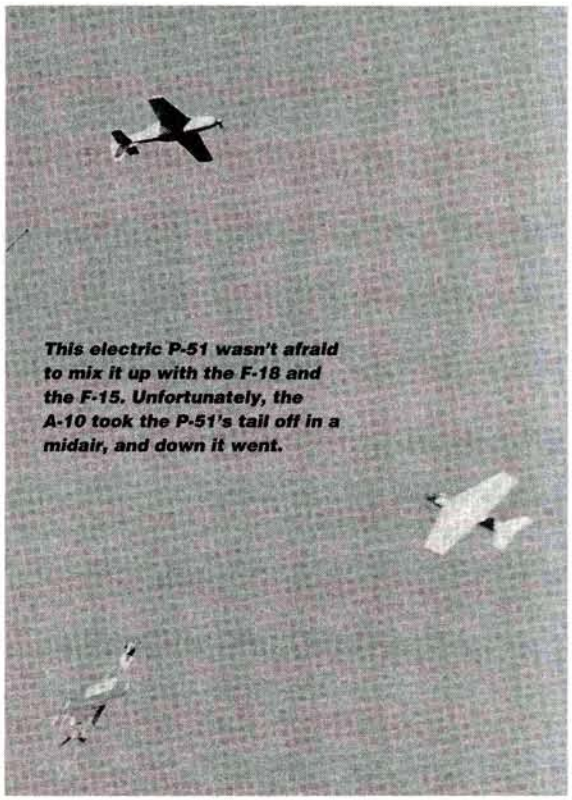
I can't understand why manufacturers do not provide self-locking nuts and slightly longer crankshafts. If they are to remain effective, nylon-insert locking nuts should be replaced regularly; you can't count the cost of safety. I know that Harry Higley and Sons Inc.* offer a thin locking nut for propeller shafts that, when tightened against the existing nut, prevents that sudden spin-off of the propeller. Harry's thin nut should be readily available through your local hobby store. Safety first!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

R/C COMBAT

by ROGER POST JR. and the FLYRC Club

TIRED OF the same old boring sport flying? Have you done enough flat spins to last a lifetime? When you and your club have reached the point of stagnation in your flying activities, you *must* try R/C combat. This type of flying is challenging, exciting to do and spectacular to watch, and even the novices in your group will be able to participate.



This electric P-51 wasn't afraid to mix it up with the F-18 and the F-15. Unfortunately, the A-10 took the P-51's tail off in a midair, and down it went.

Dogfighters for a day!

One Sunday, the Fairfield League of Yankee Radio Controllers (FLYRC) in Southbury, CT, had the chance to test-fly many combat models, and the result was the most fun the club has ever had. Eventually, we tied streamers to everything that flew, and that increased the number of fliers who could participate and substantially increased the fun factor.

LDM's F-16 is hand-launched for its first flight. To test the integrity of this kit, the pilot left his transmitter in the helicopter mode. The plane rolled into the field, was retrieved, the prop was changed and off it went again with absolutely no damage.

DECISIONS

■ **Organize.** Get your club members together, and decide which types of planes you want to fly combat with. In Sweden, they used the .15 to .20 engine size and balsa planes that weighed around 2.2 pounds, but they didn't use streamers. Yikes! They just crashed into one another; the last plane left flying won. Because mini-servos are quite costly in Europe, this proved to be pretty expensive, so the Swedes opted for .40-size, 4-pound planes that would accommodate less expensive servos of standard size.

In the U.S., the AMA 704 rules currently recognize the 2.2-pound, 1/12-scale WW II aircraft and non-scale planes—both classes with streamers. Greg Rose, the author of the combat column in *Model Aviation,* tells me that the AMA thought that the 4-pound planes posed a safety hazard, and they wanted to see the results of flying these models in a combat contest.

Fairly recently, Lucien B. Miller, of LDM Industries, formed the "Open R/C Combat Association" (ORCA) in Florida. They fly the .40-size planes and hope to get their rules recognized by the AMA. Lucien tells me that the AMA wants to see a few years of results before they'll consider sanctioning the use of the larger planes.

Certain other types of non-scale planes take a .15- to .20-size engine, and some resemble flying wings with tail feathers added. These short-coupled aircraft are extremely fast and very maneuverable. Other suitable aircraft are the .15- to .20-size Wild Things and the ever durable Kombat .40. I've included a chart of the reviewed planes and a list of manufacturers to help you come to a decision on what's right for you.

Manufacturer/Model	Scale	Span	Weight	Wing area	Engine	Prop	Materials	List price	Flying characteristics
LDM Industries/F-15	Stand-off	44"	4.3 lb.	510 sq. in.	.40/.46	10x5	PVC/f/p/b*	$39.95	Fast; big loops; axial rolls; great vertical.
F-16	Stand-off	46"	4.5 lb.	520 sq. in.	.40/.46	10x6	PVC/f/p/b	$39.95	Fast; large loops; fast rolls—on rails.
F-18	Stand-off	46"	4.5 lb.	510 sq. in.	.40/.46	10x6	PVC/f/p/b	$39.95	Extremely fast rolls; lightning speed; very stable.
A-10	Stand-off	48"	5.0 lb.	510 sq. in.	.40/.46	10x6	PVC/f/p/b	$39.95	Little slower than counterparts; more maneuverable.
Capstone R/C/Pattern Bat	Stand-off	36"	26 oz.	375 sq. in.	.09/.11	7x5	B/p	$29.99	Tight turns; fast rolls; extremely maneuverable; fast.
First Step R/C/FS-20	Non-scale	39"	2.4 lb.	468 sq. in.	.19/.25	8x6	F/p/b	$29.95	Rocket on rails; tight turns; fast rolls; very smooth.
Texas Scorpion	Non-scale	39"	2.5 lb.	430 sq. in.	.25	8x6	F/p/b	$29.95	Same as counterpart mentioned above.
Lynch's Hanger/Combat 20	Non-scale	36"	2.6 lb.	360 sq. in.	.15/.25	8x6	FP	$34.95	Endless vertical; incredibly fast; very maneuverable.
Collins Scientific/Fw-190D	1/12 WW II	36"	2.1 lb.	180 sq. in.	.10/.15	8x4	F/b/plastic	$59.95	Fast; keep close for better visual; tight turns; great ver
Northwest Tool & Supply/Me-109G	1/12 WW II	34"	2.5 lb.	210 sq. in.	.10/.20	9x6	P/b	$28.95	Same as Fw-190D.
Sig Mfg./Sig Wonder	Non-scale	37.5"	1.2 lb.	338 sq. in.	.09/.19	8x6	P/b	$39.95	Fast; smooth; tight turns; quick rolls; quite maneuver
Quality Aircraft/Wild Thing	Non-scale	36"	32 oz	362 sq. in.	.10/.15	7x5	P/b	$49.95	Very maneuverable; fast; unlimited vertical.
GT Generix Tailgator	Non-scale	38"	30/32 oz.	380 sq. in.	.15/.25	8x6	P/b	$40 for 2	Tight, fast maneuvers; great vertical; great speed.

*f/p/b = foam/ply/balsa. All require a 3-channel radio; the Capstone airplane could also use a 4-channel. For all planes, use recommended throws.

Three pilots with their LDM Industries combat planes (left to right): Craig Trachten (F-15), Mike DeHoyos (A-10) and Mike Mayes (F-18).

■ **Build.** This is the next step. The kits comprise a variety of materials: balsa, plywood, foam, aluminum and plastic; they don't take long to build. All kits include detailed instructions and/or plans, and if you run into a problem, there's always a phone number you can call. Whichever plane you decide on, make it strong so that it will survive the rigors of combat.

■ **Set the date and get the rules.** If your club plans to have an AMA-sanctioned 704 Combat event, you should contact the AMA to request a rule book and registration info.

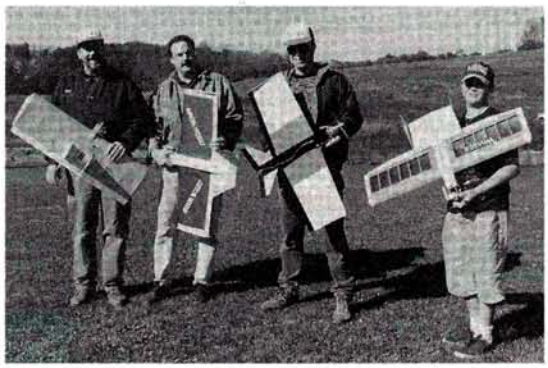
Here are a few of the AMA scoring rules for scale and non-scale combat:

- The rounds last 7 minutes.
- Your plane is up first—add 20 points.
- You cut a streamer—add 50 points.
- You keep flying after a midair—add 100 points.
- You cut your own streamer—subtract 2 points for every 1 foot cut (with a 30-foot streamer, this means a maximum of 60 points).
- You crash because of pilot error—subtract 40 points.

For a complete set of rules, see the AMA book; you might also like to subscribe to *The ACE Reporter*—a newsletter for 704 combat enthusiasts [call (814) 391-2149].

Some ORCA scoring rules:

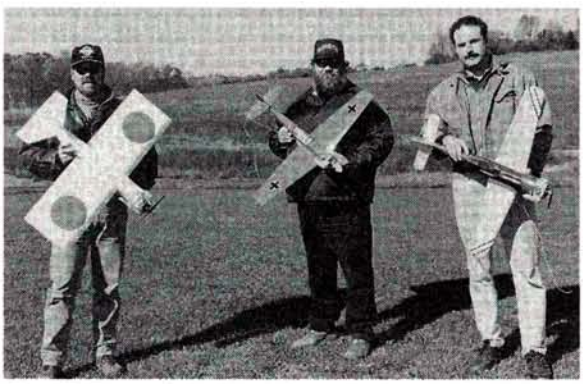
- Rounds last 4 minutes.
- Cut a ribbon—1 point.
- Get off the ground in 60 seconds—1 point.
- Midair—1 point.
- Complete the round—bonus survival points.



Left to right: Brian Cummings (with the GT Generix Tailgator), John Gallagher (First Step R/C FS .20), Craig Cestari (First Step R/C Texas Scorpion) and Matt Mayes (Sig Wonder).

For more info about ORCA, contact LDM Industries—(813) 991-4277.

Jim Reith of R.A. Cores forwarded a combat World Wide Web address: http://world.std.com/~racores/index.html and a mailing list: rc-combat-lovers-request@world.std.com.



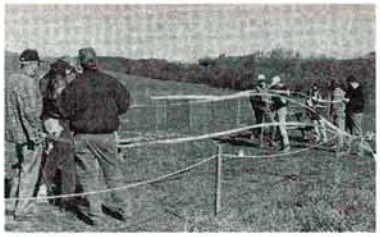
Has ZZ Top switched to R/C combat? Actually, no; Paul Grassel holds a Lynch's Hanger Combat 20, Lou Andreko Sr. holds Northwest Tool & Supply's Me-109G and John Gallagher holds Collins Scientific's Fw-190D.

FLYING

Now that you have everything set, it's time to fly. Whether you fly a .40 size, a 1/12-scale WW II, a .10- to .20-size Wild Thing, or a flying wing with tail feathers, you're in for the flight of your life. These planes are fast and responsive, and if set up properly, they can climb and dive and roll and loop like crazy.

I test-flew most of the planes, and I can tell you that if your thumbs aren't used to lightning-fast rolls and a super-responsive elevator, you should tone down the control throws. Having done this, even novices will be able to fly one of them.

If you can roll and loop, you can fly combat. The hard part is trying to cut a streamer. Of all the planes and streamers



Making streamers is a team effort, especially on a windy day. Read below for details on how to make streamers.

How to Make Streamers

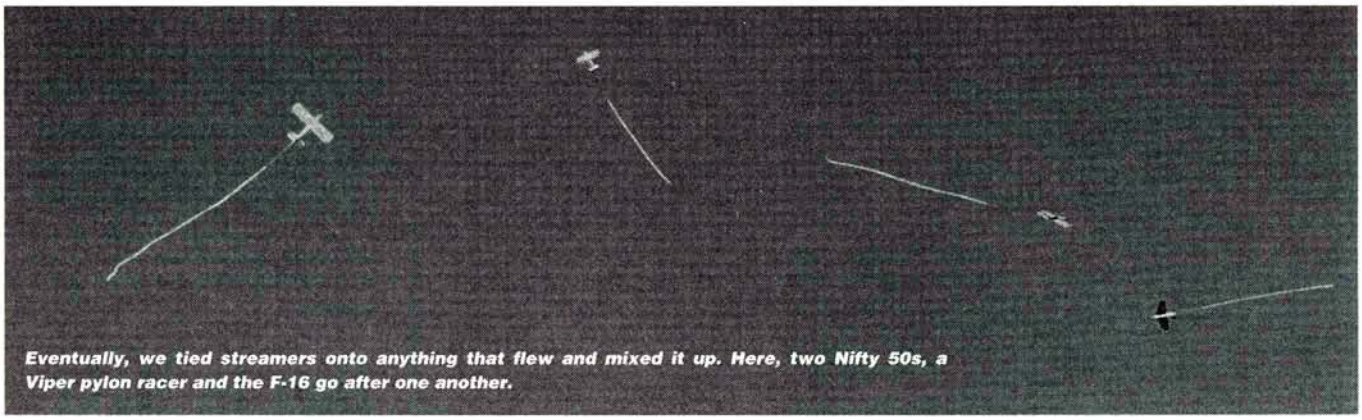
With your plane completed, you'll need to make the streamers. Lucien Miller, of LDM Industries, tells how:

Go to a party store and buy five or six, 500-foot rolls of crepe paper of different colors. For every streamer, you'll need a 25-foot length and a 5-foot length of cotton string. Having streamers in five or six colors allows five or six planes to "combat" at once; the more colors, the more planes in the air, and that makes it more spectacular and exciting to watch.

1 Before you tie the string to the crepe paper, you need to strengthen the end of the paper, or it will tear. Fold one end back on itself by 6 inches, then fold this 6 inches in half, and then in half again until you have a neat, rolled-up end section.

2 Tie 6 to 8 inches of one of the pieces of string around the rolled end of the paper, and tape it securely.

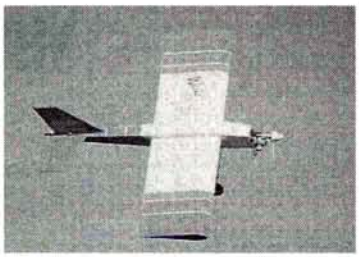
3 To make the streamer easier to launch, you need to roll it up. You can do this by putting the end of the paper into a slot in a dowel and then turn the dowel in a slow-speed drill until the streamer is wound up. It should look like a small roll of crepe paper; to keep it from unrolling before you use it, fasten it with a piece of masking tape.



Eventually, we tied streamers onto anything that flew and mixed it up. Here, two Nifty 50s, a Viper pylon racer and the F-16 go after one another.

we put into the air, only two or three streamers were actually cut by a prop. Some were completely taken off by the leading edge of a wing, and still others were left floating in the air because of *midairs,* of which we had only three during the entire event.

It isn't as easy as you might think to cut a streamer or hit a plane. For more on flying strategy, check out Air Age Publishing's newest book: "R/C Pilot's Handbook" (see Pilots' Mart for more details). In it, you'll find an excellent chapter on R/C combat by Greg Rose.



Left: Quality Aircraft's Wild Thing flies a test run sans streamer. The streamer does increase drag slightly, but if your engine is powerful and/or your airframe is light, it's hardly noticeable. In wind, the streamer actually helps stabilize the model. Right: yes, you will have carnage! This photo shows the result of some midairs and overzealous thumbs. Despite what you see here, the fun factor outweighs these results many times over. Don't be afraid; buy a kit, tie on a streamer, and go for the kill.

SORTIE COMPLETED

I have flown all types of R/C planes, and I have to tell you that R/C combat is more exciting and more fun than anything I have ever tried at a flying field.

How many fliers does it take to tie on a streamer? Left to right: Matt Trachten supervises Roger Post, Mike Mayes and John Gallagher. Be sure to attach your streamer firmly, or you might lose points for losing it.

Yes, there will be carnage. But depending on which plane you buy, you might be able to fly even when the sorties and midairs have been completed. We at FLYRC recommend R/C combat more than any other type of event, and if you want to promote club camaraderie, this is the way to do it. Just make sure you don't take out that beautiful scale, Sunday flier that has been circling lazily overhead.

R/C Combat Sources

Manufacturers	Product
Aerocraft*	Non-scale
Aerotech*	Non-scale, slope-soarers
Airplane Factory Inc.*	Non-scale
Capstone RC*	Non-scale
Cheveron Hobby Products*	Paints
Collins Scientific*	1/12 scale, WW II, AMA 704
First Step R/C*	Non-scale
Future Flight*	1/2A combat design
GT Generix*	Non-scale
Gus Morfis Plans*	More than 24 plans of 704 WW II scale
House of Balsa*	1/12 scale, WW II, AMA 704
J.C. Industries*	Non-scale
J.R. Hobbies*	Non-scale
LDM Industries*	.40-size stand-off scale and videos available
Lynch's Hanger*	Non-scale
Model Airplane News	Plans directory, scale
*Model Aviation**	Plans directory
Northeast Screen Graphics*	Scale markings
Northwest Tool & Supply*	1/12 scale, WW II, AMA 704
Phoebe Enterprises*	Non-scale
Ponds Plans*	Plans and 1/12-scale CL that can be converted to R/C
Quality Aircraft*	Non-scale
R.A. Cores*	Non-scale
*RC Modeler**	Plans directory
Royal*	1/2A WW II, can be modified for AMA 704
Sig Mfg.*	Non-scale
Trillium Balsa*	Non-scale
Verivoli Plans*	Scale plans
Zigg's Originals*	1/12 scale, WW II, AMA 704

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

Golden AGE OF R/C

by HAL deBOLT

Jim Simpson (left) presents OT R/C pioneer Frank Hoover with his prestigious AMA Hall of Fame award.

HALL OF FAME INDUCTEE

IT'S AN HONOR to tell you about a recent inductee into the prestigious AMA Hall of Fame: pioneer R/C'er Frank Hoover. OT R/C'er Jim Simpson of Rio Rancho, NM, kindly supplied me with the details. It seems that Frank's peers showed him their appreciation at a luncheon in Albuquerque, NM. Frank was also a dedicated "ham operator" (W5LQW), as were many of the attendees. The luncheon was a complete success enjoyed by all.

PIONEER R/C DEVELOPER

Frank Hoover was a native of Palmyra, PA. He first flew an R/C model in 1939, using his own home-built equipment in a Scientific Mercury. This background led him to Air Force electronics training school, and after graduation, his duties during WW II included training bombardier navigators in the Albuquerque area.

After the war, he remained in Albuquerque for six years working for the Sandia and Gulton Industries. During that time, he continued to perfect his R/C equipment, which included a very small (for the time) and reliable receiver. The heart of the receiver was the stable 3S4 tube, which keyed the dependable Sigma 4F relay. He recognized the value of this mechanism and formed the ECE Corp. to produce his first commercial radio.

At that time, everyone wanted more than one channel, so Frank's first approach to multi-channel was with the tone-activated reed bank: each of its reeds closed a relay which, in turn, set a servo in motion. While these reed systems became common among manufacturers, Frank was one of the first to replace the tubes with transistors. Furthermore, he used transistors to eventually produce a 12-channel system that did not use relays. Such "relayless" systems were the ultimate development of the reed-style R/C systems.

Frank Hoover's business enterprises went through several name changes, so his products were released under many brand names, such as ECE, C-G and F&M. No matter what the name, the performance was outstanding.

Jim Robinson of Paso Robles, CA, with his pretty Ohlsson .60 (ignition)-powered '38 Flamingo at the '95 SAM championships. (Conover photo.)

It was with the F&M Corp. that Frank made his greatest contribution to today's R/C equipment. Current systems are referred to as digital-proportional systems. Reed systems were basically "bang-bang" control systems; servos moved to full control or not at all. The value of proportional control was recognized when experts were able to play the reed transmitter sticks à la the piano. With these short pulses, the servos moved only partway from neutral and then returned. By pulsing the stick repeatedly with a finger, a less-than-maximum-control action could be accomplished. These results demonstrated the potential of proportional control.

First attempts at proportional came in single-channel days with the pulse actuators and gimmicks such as the Galloping Ghost systems, the ultimate of which probably was Walt Good's TTPW system. But something more sophisticated was needed.

The road to multi-channels was paved with analog proportional systems. This concept was a step in the right direction, but it became very complex as more channels were added, and obviously, it was not the final answer. Something simpler was needed. The solution was ultimately digital systems, which are widely used in electronics today.

Frank Hoover's vision saw digital as the path to follow instead of analog and thus his F&M Corp. was among the first to offer digital proportional to us. The "Blue Box" proved reliable and soon was dominant at the flying fields.

In 1969, Frank decided to retire from the R/C business, and he left his electronic engineering legacy to us. The AMA Hall of Fame is pleased to welcome this brilliant engineer and fine gentleman from early R/C.

AGONY OF DEFEAT

Jim Simpson also included a couple of "war stories" you may enjoy. The

SPA MASTERS CHAMPIONSHIPS

The Senior Pattern Association (SPA) continues to grow, although, for unknown reasons, the activity has yet to spread from the Southeast where it originated—perhaps because of lack of knowledge?

Senior Pattern should interest OT'ers with an R/C background; competition is varied and low key. All you need is a pattern model designed before 1970, and there are many neat ones! With it, you fly the pattern of that era—none of today's complex maneuvers. Then there are several classes grouped according to age, so that you compete with your peers. Plus, the atmosphere is sociable.

Apparently, more and more people are beginning to appreciate the activity; five meets were well-attended this year. The annual pinnacle is the SPA Masters, which was held in Smyrna, GA, on September 9 and 10, 1995. Mickey Walker's Masters report indicates attendance was up, weather was outstanding, and eight events were flown and enjoyed by all.

	Winner	Model	Engine
Pre Senior Novice	Kevin Reed	Kaos	K&B 61
Pre Senior Expert	Jon Beard	Mr. Ed	Webra 61
Senior Novice	James Ivey	Daddy Rabbit	O.S. 91
Senior Expert	Jim Eigers	Daddy Rabbit	O.S. 91
Super Sr. Novice	Frank Stewart	Daddy Rabbit	ST 61
Super Sr. Expert	Malcomb Rutledgee	Kaos	ST 61
Antique Event pre-1965			
Novice	Frank Stewart	Sultan	K&B 61
Expert	Jim Rogers	Interceptor	Webra 61
Grand Champion	Bruce Underwood		

Though it may appear that Joe Bridi's Kaos and Jim Whitley's Daddy Rabbit were predominant designs, many others were present, including a deBolt Interceptor for the first time. These people are highly enthusiastic about this activity; is it something your group would also enjoy? For info, contact Mickey Walker, 3121 Northview Pl., Smyrna, GA 30080.

Left: these are pre-1970 designs?—awfully modern-looking. Middle: Mickey Walker's deBolt Interceptor (first one in SPA) was flown to first by Jim Rogers in the antique event; Mickey was the CD. Believe this is a '63 design? Right: three popular OT designs in the SPA: Daddy Rabbit, Taurus and Kaos, owned by Darrel Kampschror, Kevin Reed and Don Reed, respectively.

Live Wire Viscount was one of the first simple pattern designs ever mass-produced. Jim Simpson says he enjoyed his reed-system-equipped Count, which made numerous flights and noteworthy landings. For instance, one day while at altitude, he tried a tail spin. Much to his amazement, the spin suddenly went "flat." He stood there in wonderment until it became too late to recover. The "landing" was across a canal bordered by dikes. To begin the search, he went to the top of the dike and was stunned to see his precious bird just inches off the ground, cradled by a corn stalk through the wing—more yet! As he approached it, another surprise awaited; the engine was still purring away! Best of all, after applying a fabric patch, he was back in the air!

This beloved bird met its demise when Jim initiated a low, high-speed pass from altitude. When he attempted to level off, the elevator servo did not respond and, as you would expect, the plane dropped straight down. The fuselage was buried up to the wing spar. Many attempts to pull it out of the soft ground failed, until eventually, a shovel was used. The reason it was so firmly lodged? The Grish "Tornado" nylon prop was still intact and serving as an anchor! How about it? Can you top Jim?

OT'ERS JOURNAL

Sometimes I digress from R/C in favor of notable OT modeling news. Larry Conover of Longmont, CO, is an OT'er for sure, and his recent effort is surely of interest to all OT'ers.

Larry had many historical photos, magazine ads, clippings, etc., from the very early gas model days. With no financial assistance, Larry and his friends compiled a first-class, 48-page "Old-Timers Journal" that brings back precious memories. With no advertising, it is an extremely well-done, solid 48-page presentation. The cost to defray expenses is only $7.50 plus $1.50 S&H. To order this fine journal, write to P.O. Box 628, Longmont, CO 80502. Until next time, remember that this is *your* OT R/C place!

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Quick wings for the fledgling

HANGAR 9 Easy Fly 40

by STAFF

HOW DO you decide which kit will make a good trainer? Quick and easy construction, good looks, durability and, most of all, positive stability for good flight characteristics are extremely important. The Hangar 9* Easy Fly 40 fits this bill.

Bill Sweet of the Flying Knights of Troy, NY, shows off his Easy Fly 40.

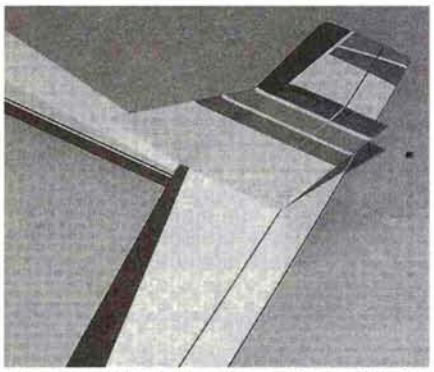
THE KIT

The components are well-packed and wrapped in plastic. The plane is nicely covered with red-white-and-blue Carl Goldberg Models Ultracote. It's easy to see in the air and more important, it's much easier to repair than that preprinted stuff other models are covered with. The ailerons, rudder and elevator come covered and hinged with CA hinges. The hardware package includes just about everything you'll need, such as wheels, pushrods, a fuel tank and a spinner. All you'll need are the radio and the engine.

The entire plane is made of balsa and plywood—no flimsy plastic parts to detract from its good looks. The fuselage is a strong box construction with lite-ply bulkheads and formers. The rear of the fuse is slotted for the horizontal stab. The engine-mount rail is made of ¼-inch lite-ply with the downthrust and right thrust already set. The nose-wheel mount bracket comes attached to the firewall, and the main-gear attachment block is grooved and drilled, ready for the installation of the landing-gear wire struts.

ASSEMBLY

• **Wing.** Remove the ailerons from both wing panels, and prepare a little 30-minute epoxy. Use a toothpick to apply a few drops of epoxy to the torque-rod holes of each aileron. Re-attach the ailerons to the wing panels, and carefully slide the hinges into place. Because you use CA hinges, you should mark the center of each hinge with a pencil to provide a reference point later when you install them permanently with thin CA. Wipe off the excess epoxy with rubbing alcohol and a paper towel, and tape the ailerons temporarily into place until the epoxy has cured.



The completed tail surfaces attached to the fuselage. Make sure that these parts are accurately aligned.

On each wing root, use a pencil to mark the location of the cutout for the servo. Be very careful not to cut or score the spar channel.

Use a pencil to mark the exact center of the dihedral brace. Test-fit the brace several times before you glue it into place. Remember to use plenty of epoxy on the wing roots. After the wing halves have been glued together, hold them together with long strips of masking tape until the epoxy has dried. Set the wing center on the bench, and place 2½-inch blocks under each tip. Let the epoxy cure overnight.

Cut the servo opening in the bottom of the wing. Use gap-filling CA to assemble the aileron servo tray. When you're satisfied with the fit, remove the covering directly under the tray, and CA it into place. Starting from the bottom, apply white tape around the center section.

• **Fuselage.** The landing-gear slot on the bottom of the fuselage is covered and should be cut with an X-Acto knife. Check the fit of each landing gear, then fill the slot with sili-

cone, and install the gear. This will protect the balsa and ply from fuel. Hangar 9 uses a spring on the nose-gear strut to absorb vibration. Later, during flight tests, I found that the plywood firewall was weak; it broke several times. Be sure to reinforce this area. I installed a piece of 1/8-inch lite-ply that runs from the bottom of the firewall to its center, just above the nose-gear bearing.

The wing dowels are installed in the drilled holes. To secure them, I used gap-filling CA on the inside of each hole. The fuel tank is assembled and installed from the rear and is placed in the pre-drilled hole in the firewall.

To accommodate several different .40-size engines, the Easy Fly 40 has a unique engine-mount system. First, install the provided special engine-mount plates on the engine, and then attach the plates to the plane. This makes it much easier to obtain the right thrust suggested by the manufacturer.

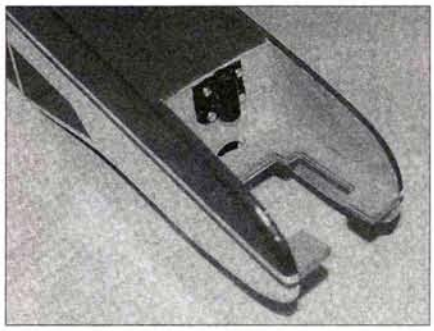
SPECIFICATIONS

Model name: Easy Fly 40
Type: high-wing trainer ARF
Manufacturer: Hangar 9 (Horizon Hobby Dist.)
List price: $149.95
Wingspan: 64¾ in.
Wing area: 712¼ sq. in.
Weight: 5 lb.
Engine req'd: .40
No. of channels req'd: 4 (aileron, elevator, rudder, throttle)

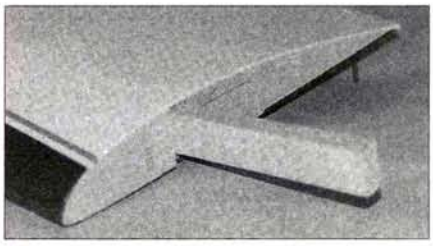
Features: completely built-up, balsa-and-ply fuselage, wing and tail components; complete hardware package including wheels, pushrods, clevises, control horns, decals and fuel tank; comes covered with Ultracote film in three colors; CA hinges.

Hits
- Complete hardware package included.
- Excellent instruction manual (well-written and well-illustrated).
- Very visible color scheme.
- Good-quality materials.
- Excellent trainer aircraft.

Misses
- Weak firewall (Hangar 9 has addressed this problem for future kits).



The underside of the fuselage front. Note the amount of downthrust in the motor mount plate.



The right wing panel with the dihedral brace installed. Liberal amounts of epoxy should be used here for a solid bond.

FLIGHT PERFORMANCE

• Takeoff and landing

Takeoffs were from a grass runway with the wind blowing straight down it. The Easy Fly's downthrust keeps the model firmly on the ground and up-elevator is definitely required to make the model rotate. Once it's in the air, things smooth out, and the model gains altitude quickly. Using the control throws suggested (¼ inch up- and down-elevator, ¼ inch left and right rudder and ¼ inch up- and down-aileron), the ailerons felt a little soft, but this is a trainer. The landing was uneventful with a smooth, stable glide and easy touchdown.

• Low-speed performance

The Easy Fly 40 handles very well at slow speeds using about ⅓ throttle. The stall speed is very slow and predictable. The ailerons are a little slow and that helps prevent beginners from over-controlling; rudder should be used to coordinate the turns. When it's pushed into a stall, the Easy Fly 40 will gently break forward, drop its nose and start flying again. It's so stable that spins are very difficult to get into (with the suggested control throws), and when you do get a spin, it's more like a slow, downward spiral.

• High-speed performance

Like most trainers, the Easy Fly is set up for slow flight. If you increase power, the model climbs. Adding a little down-trim compensates for this. But if there is enough altitude, the Easy Fly will right itself from any position. Once it has been trimmed for higher power settings, aileron and elevator response increase and response quickens.

• Aerobatics

With the controls set according to the instruction manual, the Easy Fly 40 does smooth loops, but it doesn't roll well with just ailerons; rudder must be added. Flown inverted, the model requires a lot of attention because its positive stability is always trying to return it to straight and level. After all, this is a trainer, and a novice pilot doesn't need a barn-burner. After all the initial flights had been completed, I increased all the control throws by ¼ inch. This gives the Easy Fly 40 better control response and makes it better for experienced modelers.

A second Easy Fly 40 tested was set up as a tail-dragger with a more powerful Webra* Speed .40 engine. Though the extra power made the model want to climb like a homesick angel, some down-trim and slightly shimming up the trailing edge of the wing made the model fly very well. The model, with its excellent slow-flight characteristics and extra power, does very well in the limbo, touch-and-go and spot-landing events.

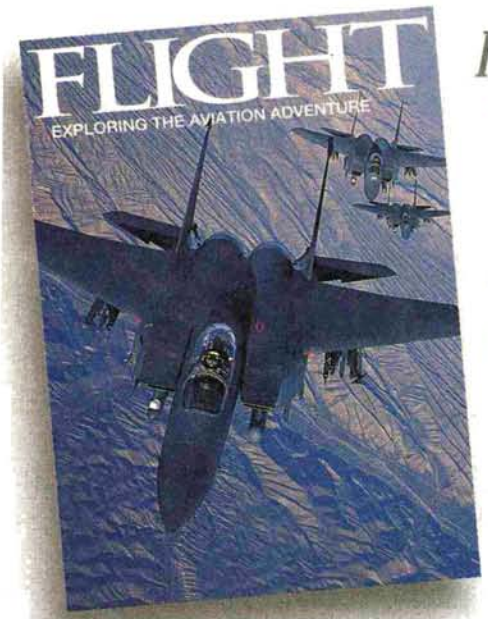
• **Tail feathers.** Use an awl to mark where the holes will be drilled so that the control horns will be easier to install. It's important to follow the instruction manual to ensure that the rudder and the elevator horn are positioned correctly. The pushrod for the elevator runs through the fuse and must have the proper clearance. Carefully remove the covering from over the slot in the front of the horizontal stab. This slot will be used to hold the vertical fin. Remove the covering that's over the rudder pushrod exit hole at the rear of the fuse. Carefully measure the location of the stab, and check its alignment. When you're satisfied, use 30-minute epoxy to glue the stab to the fuse. When you install the vertical fin, use a 90-degree triangle or a square; the fin must be perfect.

• **Radio and pushrod.** The pushrods consist of threaded rods, wooden dowels and shrink-wrap (used to secure the wires to the dowels). The proper length for each is indicated in the manual. The radio is installed in the servo mount that comes with the kit. Placing the battery under the fuel tank provides the proper center of gravity.

The Easy Fly 40 flies very well and, because I had beefed up the firewall, it can withstand the not-so-elegant landing techniques of a novice. With its bright color scheme and self-righting characteristics, the Easy Fly 40 is a good beginner's model.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

A special announcement from the publisher



INTRODUCING

FLIGHT–

a new magazine that explores the aviation adventure!

From the people who bring you *Model Airplane News* comes a new and unique quarterly magazine that captures all the drama, the history, the technology and the timeless adventure of aviation and aircraft. Introducing FLIGHT magazine!

FLIGHT looks at the world of aviation in an upbeat, captivating style that puts you right in the cockpit. From the first powered flights to WW II's Warbirds to the aircraft of today, from the compelling stories of man's brave experiences in the air to the technical details of a P-51B or Stealth Fighter, FLIGHT brings you the very best of full-scale aviation.

FLIGHT is for everyone–enthusiast, modeler, historian and pilot–who cherishes the drama of man and his flying machines.

Join us as a Charter Subscriber

As a reader of *Model Airplane News*, you're invited to accept this charter subscription offer to FLIGHT. Return the attached card today to become a charter subscriber, and you'll receive a year of FLIGHT–including the premier issue (published in April)–for only $14.95. We'll bill you later.

And here's another bonus: enclose payment with your charter subscription, and you'll receive an extra issue–five superb issues in all–for the same low price of only $14.95.

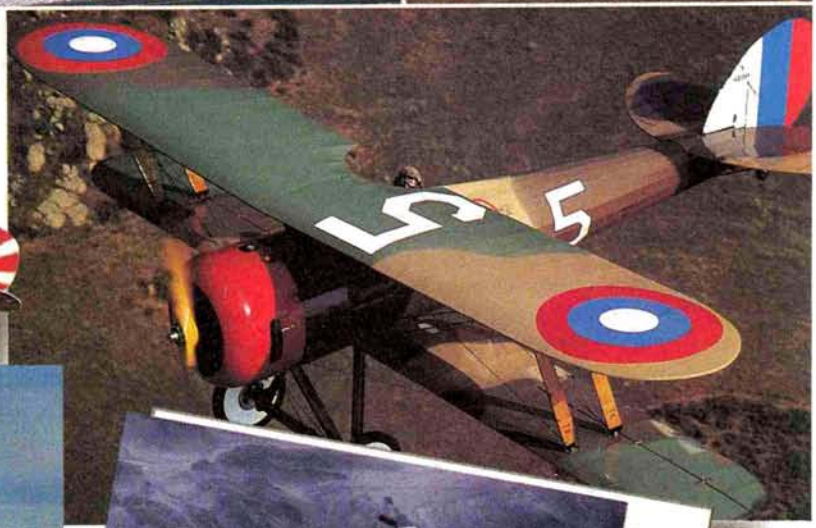
We guarantee you'll discover FLIGHT brings you the same high-quality content, the same entertaining reading, that you've come to expect from *Model Airplane News*.

Subscribe to FLIGHT now, and explore the aviation adventure!

Model Airplane News...

FLIGHT brings you:

- *Coverage of aircraft, from the Wright Flyer to the P-38 to the B-2.*
- *Stunning aviation photography.*
- *Three-views, detail photos and color schemes for modeling.*
- *The great personalities and human adventures of aviation.*
- *Visits to air shows and aviation museums.*
- *"Virtual flight"— the computer flight-simulation experience.*
- *The diversity of aircraft, from military to commercial to aerobatic.*



MODEL AIRPLANE NEWS
PRODUCT REVIEW

KelComp software for the scale modeler

Computer-Generated NACA AIRFOILS

by TOM HUNT

Editor's note: it wasn't so long ago that you had to be a fairly well-trained draftsman to design and build a scale model. In particular, ribs and airfoil sections for tapered wings required a lot of plotting and took a long time to draw, but computer software such as CAD and the availability of new airfoil software has changed the picture. Contributing writer Tom Hunt provides a look at an inexpensive program that goes a long way toward letting us throw away our French curves.

A flight of A-36As (an early variant of the famous P-51 Mustang).

KELCOMP* of Lake Havasu City, AZ, has developed a simple basic computer program that will print out any size of 4- or 5-digit NACA (National Advisory Committee for Aeronautics) airfoil. In the '30s and '40s, these airfoils were very popular on many full-scale aircraft, and some are still used today on general aviation aircraft). They make good model airfoils (see "Airfoil Selection" sidebar), and the program and instruction book help you to understand the important relationship between various airfoils and performance.

The program will run on any DOS machine, and it provides a resolution of 360 dots per inch on dot-matrix and ink-jet printers. If data transfer is your thing, output can be sent to compatible files for ModelCAD or *Foiled Again!* graphics programs. A separate function is available for browsing such files. The user can run the program directly from the disk or install the program in the hard drive using the "install" function.

AIRFOILS THE EASY WAY

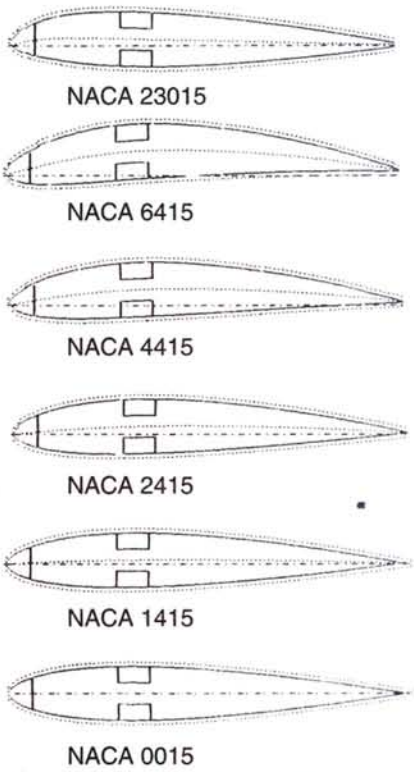
The user simply accesses the routine (on-screen menu), which prints the airfoil, keys in values of airfoil designation (such as 2412 or 23018), chord length, skin thickness, leading-edge thickness and spar thickness and width. You are also asked whether you would like a reference line on the plot and where you would like it to start (from the left). Press "Enter," and off the data goes to the dot-matrix printer.

You can also display the airfoil without printing it. To print, jump right to "Print" from the display routine. In a separate routine, the user can list coordinates of the chosen airfoil.

Included with the software is a small instruction book that provides a brief history of the development of these airfoils, their equations and some other technical talk, if you're interested. Also, some airfoil-characteristic data plots for selected airfoils can be found at the back of the book.

This is a very versatile program for the modeler who likes to build scale, accurate wings and other flying surfaces. The price?—only $15.

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.*



An illustration from the KelComp instruction book—a group of related airfoils with mean lines shown. (The airfoils in the program are much more accurate and precise.)

Airfoil Selection

Aircraft—NACA airfoil no.

■ Trainers
Stearman N2S, PT-17
2213

North American SNJ, T-6
2215, 4412

■ Fighters
North American P-51
230XX

Grumman F4F
23018, 23009

Grumman F6F
23016.6, 23009

Vought F4U
23018, 23009

Bell P-39
0015, 23009

Mitsubishi A6M0
2315, 3309

■ Bombers
Boeing B-17
0018, 0010

North American B-25
23017, 4409R

Grumman TBF
23015, 23009

Douglas SBD
2415, 2409 or 7

Martin PBM
2418

■ Transports
Douglas C-47
2215, 2206

■ Helicopters
Hughes 300
0015

■ Sailplanes
Schweizer SGS 1-26, 2-33, etc.
43012A, 23009

Brasov IS-28 (Romania)
43012A

■ Special Purpose
Pitts S-2
64XX, 00XX

Grumman Ag-Cat
4412

Smith Mini-Plane
4412

Bellanca Citabria
4412

■ General Aviation
Cessna 172
2412

Beech Bonanza
23016.5, 23012

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

CERMARK

Extra 300S ARF

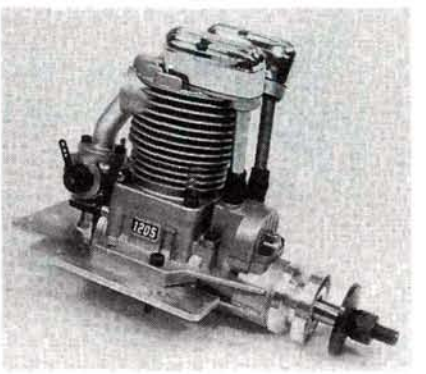
Feed your aerobatic needs with a little EXTRA helping!

by RICH URAVITCH

EVER STOP and think about what subjects might be on a list titled "The most popular airplanes of all time"? The list, of course, would require that specific categories, such as jets, prop-driven fighters, general aviation, golden age and similar groupings be established. Winners in the categories mentioned would probably be the F-86 Sabre, the P-51 Mustang, the ubiquitous Piper Cub and the WACO series of biplanes of the '30s. Now, let's open up another category: aerobatics. Any wild guesses as to which airplane has become the most modeled subject in recent times? (I won't even stack the deck by setting up an aerobatic *monoplane* category, which would eliminate the Pitts and Ultimate offerings!) You guessed it, brother modeler: the Extra series of adrenaline-pumping, face-distorting, I-hope-the-harness-holds thoroughbreds that just may be the greatest thing to come from Deutschland since Löwenbrau.

PHOTOS BY RICH URAVITCH

The Extra has been modeled in nearly all sizes for R/C from ½A right up through the monster machines flown at the Tournament of Champions. That's a lot of versions of the same basic airplane, especially considering that the Walter Extra factory in Germany, which produces the full-scale version, is not a mass-production house. You want one; you order it; and you probably wait! So, why is it so popular? Can't tell you, 'cause I haven't flown one—yet! But the importer, Aero-Sport*, is not that far away from my home, and I just may take a trip there one day to see what it's all

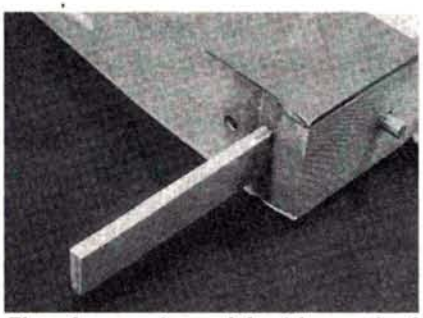


Here's the powerplant for the Extra—the Saito 120S—ready for installation. It's mounted on an aluminum plate, which is bolted to hardwood engine bearers. This is one of the nicest handling 4-stroke engines I've ever used.

about! My guess, however, as to the reason for the design's popularity is that it apparently translates well from full scale to model. Many of the same qualities and performance capabilities that make the 1:1 version a favorite among aerobatic pilots have obviously carried over to the world of R/C models.

GOOD...AND NOT SO GOOD!

If you're ready to try a mid-size Extra 300S but don't have a lot of time to build, this one might be exactly what you need. Cermark's* offering is available in a pre-finished ARF (almost-ready-to-fly) version that uses CGM* Ultracote or Hobby Lobby* Oracover to duplicate the standard red-and-white 300S scheme. There is no building to be done by the purchaser—only some minor assembly and sub-assembly build-up. The factory-provided construction, however, appears to be of high quality with no evidence of twisting or warpage in any of the airframe components. Of note and an indication of the quality of building was the sheeted area of the upper fuselage



The wing panels are joined by a pair of hefty plywood parts; this is the forward one. "Dry" fit the parts before using slow-cure epoxy for a permanent bond.

forward of the cockpit. Where we would normally use large sheets of balsa wrapped over the formers, the manufacturer chose to strip-plank this area with balsa—far more tedious and time-consuming, but stronger. Using conventional material and techniques for fabrication also offers a distinct side benefit not usually available in the world of ARFs: repairability! Underneath that pretty skin is a real model airplane "in the bones" as the elder modelers say! And those "bones" can be easily repaired if damaged and without being a composite fabrication expert! Makes a lot of sense to me!

In sharp contrast to the high quality of the model and the work that had been done by the factory were the instructions and the fiberglass parts. The 12-page manual doesn't provide much information; it's poorly written; and it contains errors and inconsistencies. Nothing of value is shown to assist in the radio installation. In all fairness, however, a modeler with experience is not likely to have a great deal of problems figuring things out; it's just that it could have made a good product outstanding if the instructions had been written better. The other shortfall is the fiberglass components, of which there are, thankfully, only two. The cowl and belly pan in my review kit were hand lay-ups with dozens of pinholes that required filling and priming before painting. In addition, the fit of the belly pan and the "described" installation method almost caused me to make a duplicate out of balsa wood. While I applaud Cermark for including durable fiberglass components rather than less expensive plastic items, I've got to believe that more attention could have been paid to their quality.

SPECIFICATIONS

Model name: Extra 300S

Type: Aerobatic, sport scale

Manufacturer: Cermark Electronics & Model Supply Co.

List price: $395

Wingspan: 61.25 in.

Length: 52.25 in.

Wing area: 687 sq. in.

Wing loading: 29.3 oz./sq. ft.

Weight: 8 to 9 lb. (review model: 8.75 lb.)

Engine used: Saito 120S 4-stroke

Channels req'd: 4 (rudder, elevator, throttle and ailerons)

Construction type: built-up balsa, ply and hardwood

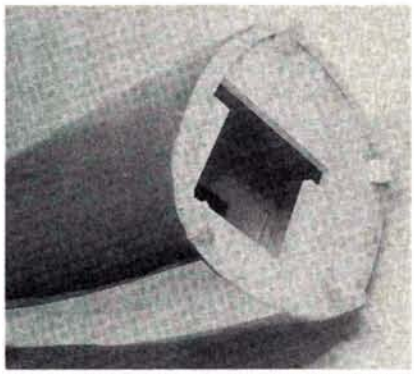
Comments: The factory construction is of high quality with no evidence of twisting or warpage in any of the airframe components. Using conventional materials and construction techniques offers a distinct side benefit not usually available in the world of ARFs—repairability! Underneath that pretty skin is a real model airplane that can be easily repaired if damaged.

Hits

- Nicely built, warp-free structure.
- Completeness of kit; includes all hardware, fuel tank, wheels and other goodies that you'd normally have to purchase separately.
- Repairable.
- Flying qualities.

Misses

- Instruction manual not of the same quality as the model.
- Fiberglass parts have many pinholes.
- Paint doesn't readily stick to blow-molded wheel pants.



The business end of Cermark's 300S. The engine-plate bearers and the fuel-tank box still need to be added. Do this accurately to avoid changing thrust settings. All exposed, raw wood should be fuel-proofed with epoxy or resin.

PREPARATION AND PERSONAL PREFERENCES

The wing panels are joined with a pair of plywood blades that are slid into the appropriate slots created by the wing spars. Test-fit these components prior to permanently bonding them by liberally coating the mating surfaces with slow-curing epoxy. Make sure the panels are properly aligned before allowing the epoxy to cure. If you choose to reinforce the center-section joint with fiberglass, remember to first remove the covering material in the area (assuming you're working with the pre-covered version of the kit).

When you build up the engine-mount assembly, make absolutely sure that the beams and sheet material all come together without introducing any thrust variations. I didn't, and I ended up with upthrust, which was remedied by making a new metal engine-mount plate and zeroing the thrust when mounting the engine to the plate. I fuelproofed the entire tank compartment and firewall area by applying a coat of finishing resin followed by a brushed coat of Cheveron* Red, which almost perfectly matches the film covering. I also used Chev-eron spray to finish the fiberglass

cowl and belly pan. While on the subject of paint, the wheel pants supplied are blow-molded from a polyethylene-type material. While it's rugged, durable and a great choice for its application here, it's a bear to get paint to stick to it for any length of time. You have a number of choices: live with the milky white color; be prepared to re-prime and re-paint as required; leave the pants off altogether (nah!); or make or get new aftermarket items that will accept (and retain) paint. This is the option I chose, and the pants are still holding up well!

After completing all the sub-assembly work, fuel-proofing and hinge installation (I substituted the factory-supplied hinges with CA-bonded, non-pinned items), I proceeded with the engine and radio installation. To ensure an adequate supply of "urge," I opted for the Saito* 120S 4-stroke engine. This has proven to be one incredible powerplant and one that will find its way into any of my future projects that require this size of engine. Properly "air-screwed," it will haul the 9-pound Extra vertically with near impunity. It's quiet, tractable, "torquey," has a great idle and is one of the friendliest engines I've run in a long time. It's also the only Saito 4-stroker in my inventory but will probably not be the last!

FLIGHT PERFORMANCE

Like old friends becoming re-acquainted, we were comfortable! The Saito hand-started after choking a bit, and I let it warm up at a fast idle before throttling back to low engine, high trim. Check the throttle response, and taxi out. Seems as if we've done this lots of times before!

• Takeoff

As I gradually advanced the throttle, the Extra started left, which I corrected with a little right rudder. The tail came up, I got off the rudder, and it tracked straight down the runway for about 100 feet and lifted off cleanly. I set up a gentle climbing turn to the right and headed downwind, coming off on the power a bit. Trim check. A little nose-up, right rudder and just a touch of right aileron allowed the Extra to cruise along its merry way, hands-off. Was that a huge sigh of relief? I guess you can't escape *some* butterflies!

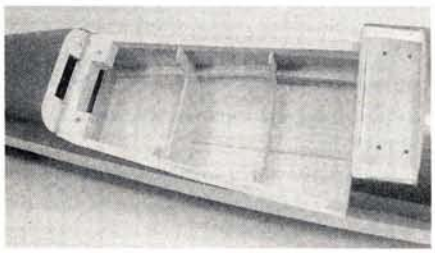
• Maneuverability

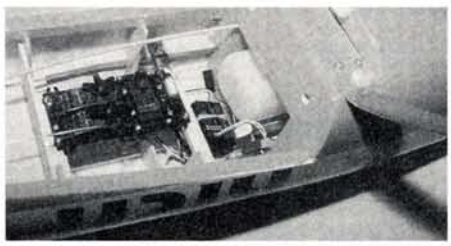
The aileron response is excellent in high rate—faster than I expected. High-rate elevator and max rudder will be required for snap maneuvers, and relaxing input will bring a remarkably fast return to straight and level. The airplane is very neutral; true spins may require two revolutions for recovery, especially if you allow them to flatten.

• Landing

My first landing with the Extra was a bit bouncy; the long landing gear contributed, but it was mostly my technique. I was a little hot on final. I blew the wheel-landing technique and ballooned it back finally to a three point. Nothing damaged but my ego! Subsequent arrivals were much better; speed can (and should) be bled off to the point where three-pointers are easily doable, and they look so good!

A little last-minute dressing up included polishing the aluminum landing gear, installing a pilot figure, adding some personalized markings and attaching the canopy with Zap* Formula 560 canopy glue rather than with the four wood screws specified in the instructions. The wheel-pant installation diagram is more confusing than it needs to be. This is one of those areas I mentioned that could really use some work. On the positive side, it's one of the more complicated procedures required in the assembly of Cermark's 300S. Since we're in the landing-gear department, plan on hangaring your Extra on a rack, hung from the ceiling, or on a sheet of thick, dense foam. The foam material used for the tires is great where excess weight might be of some concern, but your new, 9-pound Extra will create flat spots in the tires overnight if all its weight is borne by the foam tires! Either swap them for a more solid material, or be more aware of the potential problem. It seems that we're now closing in on the fun part of this project—the flying!





Left: the fuselage interior prior to the radio installation. There's plenty of room to shift the battery pack around to get the balance point right! Structure is very neatly built; good quality, too! Right: the cavernous "radio room" allows you to shift things around to compensate for light/heavy engines. Most installations shouldn't require the addition of weight to get the balance point to fall where it belongs.

The radio space allotted in the Extra is huge; there's enough room to allow for moving the pack around a bit to correctly place the CG. I used standard servos with a 1200mAh pack placed as close to the recommended CG as possible.

FRIENDLY SKIES

Since I've temporarily (but not according to my wife) relocated to Florida, I can appreciate the value of being able to fly nearly year round. Unlike back home in New York where winter curtails most flying, southern climes add considerably to the time available to enjoy the airborne phase of the hobby. When I took the Extra out for the test hop, it was mid-October, the temperature was around 80, and the sky was as you see it in the pictures! As the commercial goes, it doesn't get much better than this! I pushed the model down the runway to check the tracking, adjusted the gear and fueled up. A gentle breeze was all that we had, and it was blowing right down the runway, which is always narrower than I'd like for first flights. One feeling became very obvious as I prepared to fire up the Saito: where were the butterflies? You know—the ones that *always* creep up on first flight days? They were elsewhere, apparently, as all I felt was a great deal of confidence about how things were about to go. The Extra, the Saito and I were ready!

Do I enjoy this engine/airframe combination? Absolutely! Every time I take it out to the field I enjoy it more. In spite of some annoyances that I've already pointed out, this model should fit nicely into the R/C future of those modelers with no time or interest in building but who realize great enjoyment from improving their flying proficiency.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

MODEL AIRPLANE NEWS
ENGINE REVIEW

by MIKE BILLINTON

Saito FA-100 Flat Twin

Lasting horsepower for scale models

THIS JAPANESE company's enthusiasm for producing 4-strokes shows no sign of slowing. It now offers at least 18 models, of which six are of the flat-twin layout. Because it's relatively easy to use and has low levels of vibration, many argue that the flat twin is the best for scale models.

All flat twins have a one-piece cylinder/head casting. Saito has certainly solved the problems associated with fitting the poppet valves together with their seats and guides from inside the cylinder itself. There are no head bolts (these usually interfere with the ideal inlet and exhaust passages), and because there's no head joint, there's no "leak path."

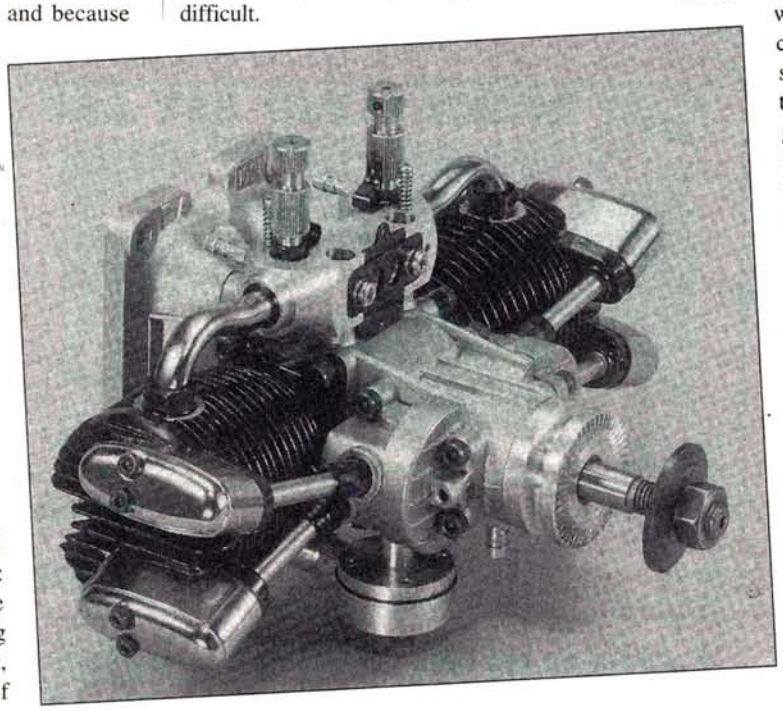
The 1ci (16cc), flat-twin FA-100 tested here is almost the smallest in Saito's flat-twin range (there is a 10cc engine). Even so, it can satisfactorily power craft weighing up to 10 pounds (or even heavier ones with more wing area, if a more gentle performance is acceptable). Saito recommends it for all .60-size 2-stroke aircraft.

The Saito 100's single-throw crankshaft (single crankpin) is light, economical and of simple construction: the two pistons travel in the same direction, and firing points are 180 degrees apart, followed by 540 degrees of induction and exhaust strokes. This "asymmetrical" arrangement can't work quite as smoothly and evenly as the twin-throw crankshaft method, but the 100's single crankpin does allow the use of a forked conrod; as a result, both cylinders are directly in line with each other, so they don't suffer from the lack of balance—and increased vibration—that results from having offset cylinders.

MAKE BOTH CYLINDERS WORK

This problem isn't specific to this engine, but I've been meaning to address it for some time: if, in a twin-cylinder glow-plug engine, only one cylinder is actually working, then power will be low. It's therefore important to verify that both cylinders are operating.

When one cylinder on a multi-cylinder engine "opts out," it's more difficult to tell, and the effect on power is less apparent; but even with a twin cylinder, it isn't always obvious when one cylinder isn't firing. This is because what you expect to hear depends on the throttle opening, the prop size and how familiar you are with the engine's sound. With a new, unfamiliar engine it can be difficult.



You might find these quick checks helpful:

- Put one hand near the end of the exhaust stacks, and it will be obvious if a stack is cold, wet and not firing.
- If you markedly reposition one of the fuel needles and this has no effect on the engine's operation, that cylinder is probably "dead."

The reason for the potential problem? A spark plug will fire even when the mixture is too rich, but a glow plug is much less tolerant; it will swiftly be doused by excess fuel, and it will stay that way—particularly when the other cylinder is doing all the work and is continually dragging cold fuel through the dead cylinder. To correct the situation, you have to cut off the fuel supply to the cold cylinder until it has cleared, apply current to the plug and try to get that cylinder to re-start while the engine is rotating (courtesy of the working cylinder).

Early in my tests of this engine, it became clear that when, as usual, I varied the size of the prop, I also had to alter the main fuel-needle setting. This "needle-twiddling" increased my chances of getting an over-rich setting, but eventually, I established which fuel setting I needed to obtain a specific rpm level.

As long as I opened both needles to a predetermined figure and good (medium range) glow was available at the plugs, I was assured of correct twin-cylinder starts. That's why I show fuel settings—related to full-throttle rpm—on the graph. For high rpm (near to 10,000) Saito recommends three turns open. With the more usual approach of using a safe, over-rich setting for initial runs, you incur the risk that one cylinder might quit because the glow plug is extinguished by excess fuel. So, use the correct settings to get a twin-cylinder start, then immediately go to slightly richer settings on both needles to complete running in.

The idle (air-bleed screw) mixture controls should each be set to seven turns open, because it's just possible to "flame out" one cylinder if the mixture is too rich (closing the air-bleed screws over-richens the mixture—which is the reverse effect of normal fuel-needle operation). Understandably, the settings of these idle-screw controls do not have to be varied with rpm, because the idle rpm is not expected to change—almost irrespective of load!

MECHANICAL DETAILS

- **Main, aluminum, crankcase casting**—a fine, sophisticated piece of work that shows Saito's experience in this area. The

WEIGHTS AND DIMENSIONS

Capacity	0.997ci (16.338cc)
Bore	0.921 in. (19 mm)
Stroke /bore ratio	0.812:1
Timing: Inlet opens	38° BTDC—total: 283°
Inlet closes:	65° ABDC
Exhaust opens	80° BBDC—total :280°
Exhaust closes	20° ATDC
Overlap	58°
Combustion volume	1.18cc (average)
Compression ratio	Geometric 7.9:1 (average)
Cylinder-head squish	0.43 in. (1.09mm)
Cylinder-head squish angle	0°
Squish-band width	0.45 in. (1.16mm)
Carburetor bore	0.236 in. (6mm nominal)
Crankshaft diameter	0.472 in. (12mm)
Crankpin diameter	0.2755 in. (7mm)
Crankshaft nose thread	7x1mm
Wristpin diameter	0.1965 in. (5mm)
Connecting-rod centers	1.3 in. (33mm)
Engine height (carb. to air pump)	2.8 in. (71.2mm)
Width (across cylinder heads)	6.8 in. (173mm)
Length (prop driver to rear radial mount)	3.91 in. (99.4mm)
Radial mounting-hole dimensions	70x50x4mm
Frontal area	10.3 sq. in.
Weight (w/exhaust stacks)	30. l oz. (853g)
Crankshaft weight	2.2 oz. (63g)
Piston weight	0.30 oz. (8g)

PERFORMANCE

Max. b.hp: 1.36 @ 10,800rpm (exhaust pipes and 10% nitro)
Max. torque: 160 oz.-in. @ 6,500rpm (exhaust pipes and 10% nitro)

RPM ON STANDARD PROPELLERS

Prop	Rpm
20x 6 Zinger	5,380
14x14 APC	6,640
15x8 APC	8,085
14x 7 Graupner	8,440
13x10.5 MK	8,510
12x12 APC	8,695
15x6 Airflow	8,810
13x6 MK fiberglass	10,810
13x6 Top Flite M.	10,880
12x6 Graupner	11,680

Performance equivalents

B.hp/ci	1.364
B.hp/cc	0.083
B.hp/lb.	0.723
B.hp/kilo	1.594
Oz.-in./ci	160.500
Oz.-in./cc	9.790
Oz.-in./lb.	85.050
Newton meter/cc	0.070
B.hp/sq. in. (frontal area)	0.132

Comments: Saito now offers at least 18, 4-stroke engines, six of which are of the flat-twin layout. Because of its ease of use and lower levels of vibrations, many argue that the flat twin is best for scale models. The 1ci (16cc) FA-100 is almost the smallest of Saito's twins (there is a 10cc), and it's a fine, sophisticated unit. This engine is a testament to Saito's long experience in the manufacturing of 4-stroke engines. It will satisfactorily power models weighing up to 10 pounds, and Saito recommends it for all .60-size 2-stroke aircraft. If used correctly, this engine should operate well for a long time.

Manufacturer: Saito Seisakusho, Ltd., 22-7, Tokagi, 3-chome Ichikawa-Shi, Chiba Prefecture, Japan.
Distributor: Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821.

PHOTOS BY MIKE BILLINTON

The disassembled Saito FA-100—impressve quality throughout.

hardened-steel crankshaft is heavily counterweighted to cope with the two rods and two pistons hanging on the single crankpin.

• **ABC one-piece cylinder/head castings**—using 9mm valves. These exemplify advanced engineering techniques and offer Saito great advantages. This particular engine did, however, show just how demanding the method is, because one cylinder (the right one, looking from the front) had a slightly greater combustion-volume clearance, so the cylinders have different compression ratios (7.6:1, right; 8.2:1, left).

This isn't enough to affect general running, but it does mean a slightly lower temperature in the right cylinder, and this might have been why it occasionally flamed out. It's interesting that another manufacturer—OPS—provides cylinder shims to allow cylinder pressures to be tuned exactly in their 60cc twin 2-stroke. They say it's nearly impossible to know the exact conditions in each cylinder; more important, the two cylinders might require different chamber geometries to offset dynamic differences caused by crankshaft rotation and/or inadequacies in one of the carbs. I bet we rarely have all the cylinders in any multi engine running exactly the same, so the main question is: what's a reasonable variation? The 100T's performance shows that it's within what's reasonable.

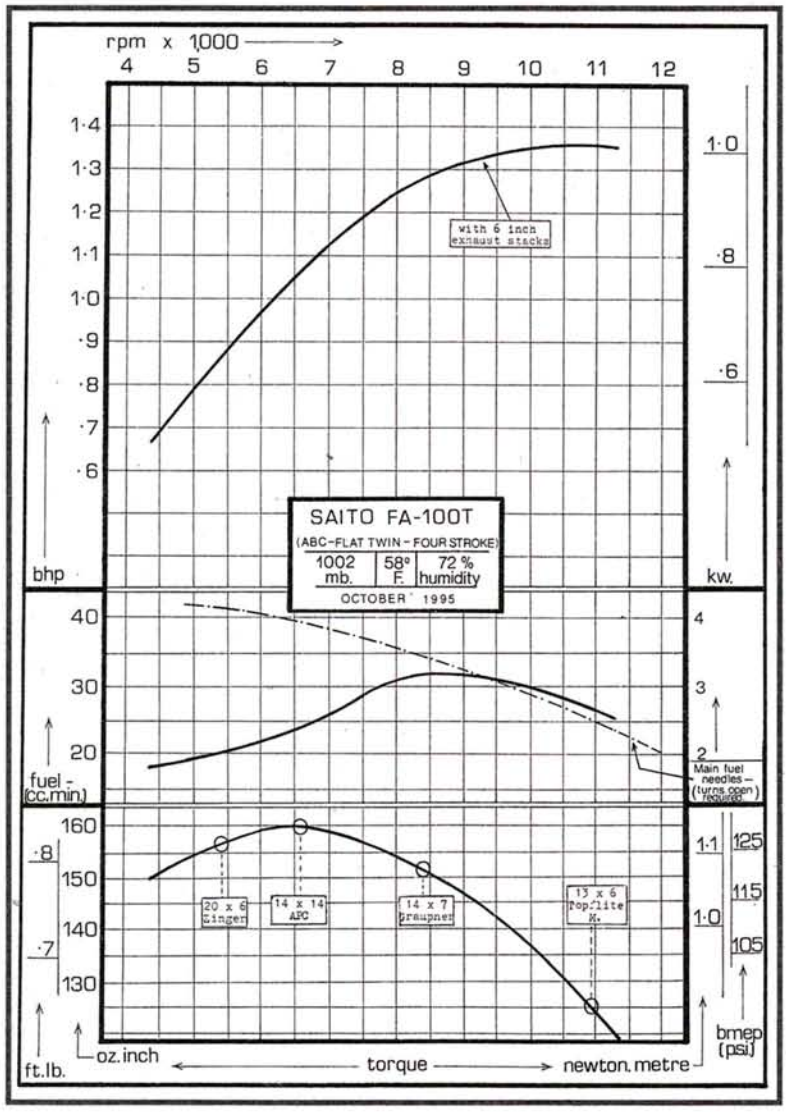
• **High-silicon pistons.** Each has a cast-iron ring; skirt is 0.001 inch and crown clearance is 0.003 inch. With the finely constructed chromed-brass liner, they gave a very strong compression seal, even when new, and this *improved* with running. This has considerable bearing on the question dealt with above, because the better the seal, the higher the cylinder pressure and temperature, so performance changes over time as the engine is run. For this reason,

My dynamometer tests showed the high-torque performance that's typical of Saito engines—and the usual Saito "not quite frugal" fuel consumption. Clearly, these aspects of performance are related: can't get one without the other.

it's unlikely that cylinder conditions will remain precisely the same.

The single crankpin leads to another interesting point: with both pistons always going in the same direction, the air in the crankcase is essentially stagnant (but it's churned up as always by the crank and rods, etc.)—strictly no change in volume, and really no new "replacement" air. What a potential mess! Fortunately, the folks at Saito were smart enough to anticipate this and to fit a cam-operated diaphragm air pump. Without the forced ventilation this provides, the engine's lower end would suffer from condensation, and combustion-gas products would inevitably leak slightly through the piston-ring gap. This (essential) seepage does lubricate the rod and main bearings, but it must be kept "on the move," and the diaphragm air pump ensures this.

Although the lengthy instruction leaflet doesn't make it obvious, you have to connect the air-pump nipple to the fitting in the backplate with the supplied tubing. The engine would run perfectly without this connection, but it wouldn't last nearly as long because the bearing and cam would become corroded.



SOME DYNAMICS!

As soon as I started to run the Saito 100, I wondered just how I should wire up the glow plugs and how it would affect the twin-cylinder running problem. I have previously preferred wiring up plugs "in series" so that if one plug blows, the circuit is broken and the other plug doesn't immediately glow too bright and burn out (which can easily happen if a marginal power source is being used but wired "in parallel").

But the "series" method doesn't fit in too well with the need to apply current to get a failed cylinder to re-ignite (as occasionally happened with the 100T). This is because the routing of series current to both plugs will give unnecessary extra glow to the already well-running single cylinder—and will probably burn that plug out anyway. I've reluctantly used parallel wiring, i.e., separate to each plug. But I use a power source that's large enough to ensure similar glow brightness whether either or both plugs need to be lit. If one cylinder "flames out," re-lighting just that one plug does the trick without any chance of harming the other plug.

While running the engine in, I wanted to keep bearing loads way down, so I started with physically light propellers, e.g., the 13x6 Top Flite, and kept the throttle well closed because Saito specifies that early rpm should be kept near to 4,000. This is probably because the heavy-duty aluminum forked connecting rods have to be carefully run in because they don't have the usual phosphor-bronze bushings. I ran the engine for 30 minutes, gradually increasing load and speed, and everything worked as planned. Constantly checking rpm, I fitted a range of propellers, and

SAITO FA-100 dB LEVELS	Wind 4mph				
9 feet. AMA/USA	15x8 APC at 7,900 rpm	98	92	92	92
	13x6 MK at 10,800rpm	101	98	97	98
7 metersat BMFA/UK	15x8 APC 7,900 rpm	91	82	82	82
	13x6 MK at 10,800rpm	94	88	88	88

Engine: Saito FA-100 twin (1ci)
Equipment: 6 inch open exhaust
Fuel: 10% nitro with methanol
Temperature: 56°
Humidity: 70%
Pressure: 1001mb
Meter: Radio Shack type 33-2050 using GA601 calibrator set to NPL standard
Height: meter and engine set approximately 3 feet above concrete
Location: outdoors, next to farmland

dB meter

eventually, I was ready to allow the 100T to really open up.

Saito specifies a "useful rpm range" of 2,500 to 10,000rpm, but they suggest the use of 12x8 and 13x6 propellers, both of which allow rpm around 10,700. The test engine itself sounded very comfortable and revved smoothly up to 11,000rpm, but consider this the maximum, because going to 11,700rpm led to harsh running conditions.

At the other end, 5,380rpm on a 20x6 Zinger was the lowest practical speed, and the plugs needed current to keep the engine going at ½ throttle; full throttle, though, was fine without external plug current.

POWER TEST

Engine tested with: *6-inch exhaust stubs; fuel: 10 percent nitro/20 percent ML70 synthetic oil/ 70 percent methanol; Saito P3 plugs.*

Saito advises against using castor oil in their engines, because its use causes excessive carbon build-up. They want us to use synthetics. and that's fine with me. But what percentage? How lean should the setting be?, etc., still loom as major questions.

The 100T didn't come with any mufflers. The convoluted exhaust stacks are supposed to provide enough silencing for most scale use, and the dB figures show that this is the case. But extra mufflers at the end of the stacks would reduce noise even further.

My dynamometer tests showed the high-torque performance that's typical of Saito engines—and the usual Saito "not quite frugal" fuel consumption. Clearly, these aspects of performance are related: can't get one without the other. I couldn't reach the Saito claim of 14cc/minute fuel consumption at full throttle, except down at 4,000rpm. Conversely, the final best horsepower of 1.36 was clearly above Saito's claimed 1.2hp. They're producing engines so profusely these days that perhaps I was already testing a later development of the 100T!

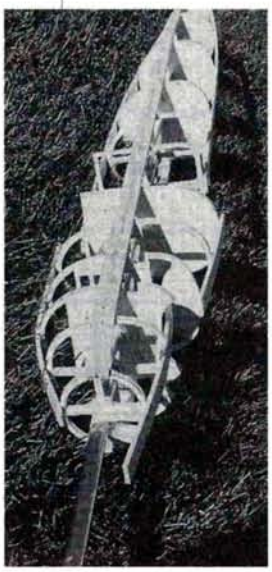
FINALLY...

Right now, Saito is the most active 4-stroke model-engine manufacturer—and it shows: they're getting so many of the intricate details right. It therefore isn't surprising that the 100 Twin proved strong and highly usable, and if operated correctly, it should operate well for a long time.

by BOB UNDERWOOD

BUILDING STRAIGHT, ROUND FUSELAGES

WOULDN'T IT BE wonderful if all aircraft had flat-sided, rectangular fuselages? They're so easy to build and keep straight. But for dumb reasons such as streamlining and aesthetics, aircraft designers insist on giving them rounded, graceful shapes. I suspect that we scale builders could form a lobby and try to convince designers to use only flat surfaces in the future; but then we would be reproducing aircraft from the past! Maybe we could convince static judges that they're looking at a flat, two-dimensional view of the aircraft, ergo, the model should be as well. Won't work, you say? I was afraid of that. I guess we're stuck with trying to reproduce round fuselages!



Left: the start of fuselage construction for a Russian Stormavik using the aluminum-tube technique. Right: the author's daughter, Anne, with the bare bones of the Stormavik fuselage.

Bob with his impressive Stormavik. The construction method Bob describes will ensure that you build straight, round fuselages.

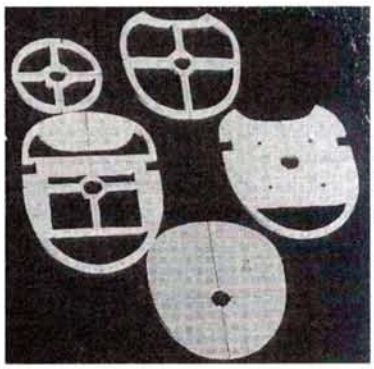
ROUND AND STRAIGHT

There are a number of ways to build a round fuselage. Unfortunately, there are also a number of ways for it to wind up banana-shaped. In almost every case, the "crookedness" comes about due to the use of wood of dissimilar hardnesses. As the wood is bent to form the tapering fuselage, there is a tendency for the harder stock to pull the fuselage in its direction. How can we overcome this tendency? The obvious answer is to be careful with wood selection.

Let's look at several other techniques we can use to ensure the accurate reproduction of shapes. In some cases, a box-like structure is built inside the round shape. Formers are then added to the outside of the box, and stringers are glued to the formers to create a round fuselage. This works pretty well, but you have to be careful about the weight of the balsa you select because the fuselage will be heavier as a result of the extra wood. Bear in mind that the bulk of that extra weight is behind the CG, and that's never a good scenario. This type of structure works well with models that are to be fabric-covered. A Gee Bee quickly leaps to mind.

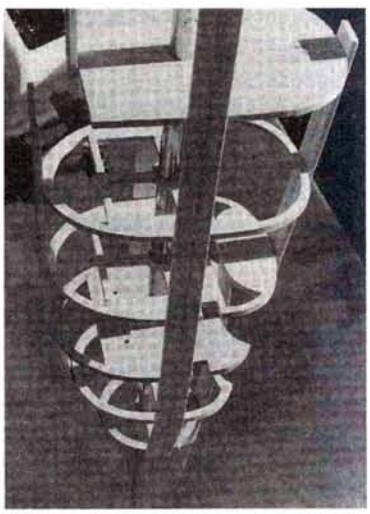
A second method is to split the formers in two and build each half of the fuselage flat on the building surface. When two have been completed, they are joined. The former split could be along the vertical or horizontal center line of the model. The important thing to remember is not to build two of the same half! That will go a long way toward spoiling your day.

Quite frankly, my success with the latter method has been marginal, probably because though I am not quite a chain-saw type of builder, my precision sometimes leaves something to be desired. Therefore, I developed a method that allows some latitude for sloppiness and is a guarantee against producing a banana-shape fuselage. I refer to the "Reynolds™ aluminum tube method"! I have used it over

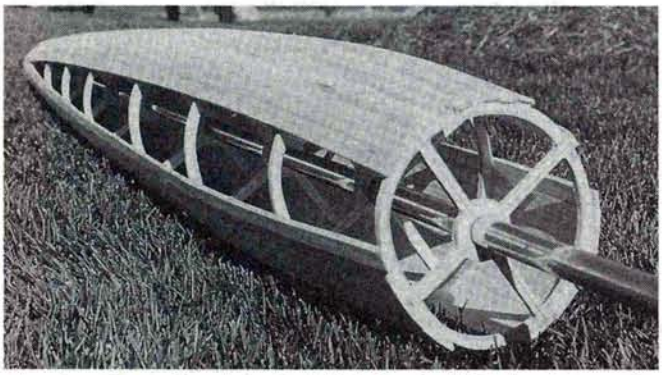


PHOTOS BY BOB UNDERWOOD

A few of the formers. The web-like portions of the formers are later cut away when the sheeting is almost complete. The material you can use ranges from balsa to lite-ply to aircraft-grade plywood.



The engine-mount area of the model with the first strips of planking in place.



The almost round fuselage of a WW II Russian PE-2 close to completion. At this point, pushrods and other stuff can be installed before the fuse is finally buttoned up.

and over with round or nearly round fuselages such as those on the Russian Ilyushin IL-2M3 Stormavik, Petlyakov, Alcor C.6.1 and others.

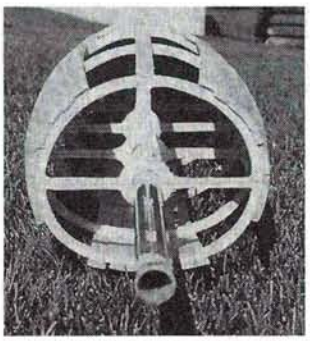
BUILDING ON A TUBE

The method is pretty simple and revolves around threading bulkheads (formers) onto a piece of aluminum tube that stays in place during the actual sheeting of the fuselage. But I'm ahead of myself. First, travel to your handy-dandy hardware store and pick up a piece of the aluminum tube. You should find it in both 1 inch and ¾ inch diameters. It's smooth, polished, straight and strong. For most purposes, a 6-foot-long piece is adequate.

Next, lay out all the formers. To do this, establish a center line for both the horizontal and vertical views on the plans. Actually, most 3-views already have these. Then, at each point where a former is located, carefully measure the distance from the center line to the fuselage edge. Subtract ⅛ inch from each dimension. This will take care of the sheeting thickness later in the process. Use a sheet of paper for each former, and draw center lines on each one for both the vertical and horizontal dimensions. Transfer the earlier measurements to the sheet to produce an outline for the former, which is now ⅛ inch undersize all the way around. If the fuselage is actually circular, then trot out a compass, and you're home free. If it is not a true circle, then you have a little more fussing to do. I draw one half (right or left), fold along the vertical center line and trace the drawn shape. You may not have a perfect shape, but at any rate you'll have two sides that match.

The next step is to cut out the former drawings and rubber-cement them to balsa or plywood stock. Your wood selection depends on where the former is and the job it's called on to do. You can then cut them out. Using the compass, draw a circle slightly smaller than the diameter of the aluminum tube. Use the point where the two center lines intersect as your center. Cut the circle out, and leave a hole slightly smaller than the diameter of the tube.

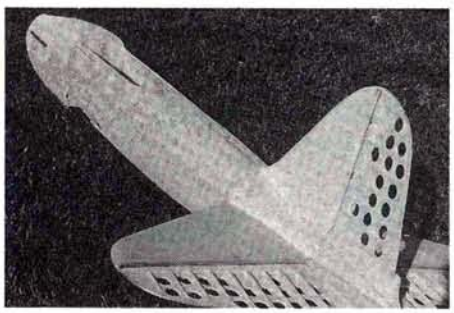
Lay the aluminum tube on the plan, and use a permanent marker to mark the former stations on the tube. You can double check this with measurements transferred from the side view to the tube. Thread the formers, in their proper order please, on the tube. Put a piece of masking tape on either side of every former to keep it in its proper place.



Looking from the nose of a Russian PE-2. The 3/16-inch-thick strips require considerable sanding but allow you to correct errors.

I use 3/16-inch soft balsa for the fuselage sheeting. This is thick enough to allow you to sand rough edges, humps and bumps and still retain a satisfactory thickness. Generally, the strips are cut somewhere between ⅜ inch and ¾ inch wide, depending on the overall fuselage diameter (curvature).

Start at each of the four center lines on the formers (right, left, top, bottom), and attach one strip to each side of the center line. Yes, it does take a bit of work to get these first strips lined up properly. By sighting down the former center line, you can tell whether everything is lined up. Laying the structure over the plans will also help this process and allow you to see whether what you are building matches the plan's outline. Take special care to see that the formers are square to the tube, especially the one for mounting the engine, if it's to be radially mounted. You may have to shift some forward or backward to keep the flow of the curve smooth.



As we move toward the model's completion, the rough sanding has been finished. After finish-sanding, fiberglass cloth will be applied in the same way as it's applied to a sheeted wing.

From this point on, it's a simple matter of stripping away (the fuselage—not your clothes!). You will have to sand a beveled edge on each strip before you attach it. Move around the fuselage, and work from each center line until you have just about filled everything in.

Before those last pieces are added, make sure that you remove the masking tape from the aluminum tube. Additionally, you may wish to cut away parts of some of the formers, install pushrods, etc., before you close the door!

After it has been completed (or nearly so), you can pull the aluminum tube out and, bingo!—a round, non-banana-shape fuselage! Sand away to your heart's content. Oh yes; it would be wise to use a "sandable" glue for the joints. To finish off this type of fuselage, I cover it with light fiberglass cloth, just as I would a sheeted wing.

VARIATIONS

Though I have never done it, it would be possible to fake a fabric-covered, stringer fuselage using this technique. After the sheeted tube has been completed, stringers could be glued to the outside. To lighten up the mass somewhat, I would suggest a flock of holes between the stringers.

One warning: when you cover with the fiberglass cloth, don't get too carried away with the sanding! If you take too much of the cloth and the resin or epoxy away, in time, the adhesive that holds the balsa strips together may bleed through the finish.

A last thought: if you get tired of the project before you finish, you can always use the partially completed fuselage—still attached to the aluminum tube—as a Wiffle™-ball bat. Your kids will love the time together as a family!

End your fuel-draw problems

MODEL AIRPLANE NEWS
PRODUCT REVIEW

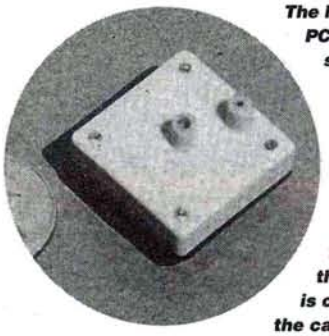
Proportional Fuel-Control System

by ROY DAY

FOR MOST 2- and 4-stroke engines, it's necessary to install the fuel tank close to the engine and no more than a fraction of an inch above the carburetor. This allows the carburetor to draw fuel reliably, and it minimizes changes in the mixture ratio as the fuel level in the tank goes from full (rich) to empty (lean). But when the Proportional Control Fuel System (PCFS) by Cline and Associates* is used, the engine receives fuel consistently regardless of the tank location.

SYSTEM OPERATION

The PCFS consists of a postage-stamp-size regulator, a check valve, a 6-32 inch crankcase pressure tap for 2-stroke engines and assorted "T" fittings and plugs for the lines. The entire system weighs less than 1 ounce. The heart of the PCFS is the regulator, which works with fuel-tank pressure derived from either the muffler in the case of 4-strokes, or from the crankcase for the 2-strokes. A tiny, one-way check valve in the pressure line from the muffler or crankcase allows pressure to build up in the tank. This pressurized fuel is fed to the regulator, which releases the right amount as the carburetor draws on a diaphragm in the regulator.



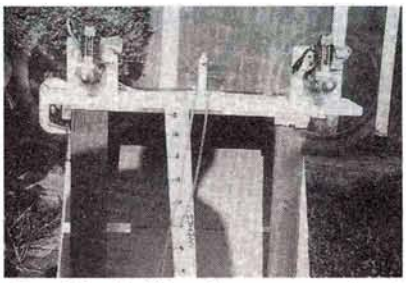
The heart of the PCFS is this small regulator, which weighs about ⅓ ounce. Input to the regulator is the pressurized fuel line from the tank; output is connected to the carburetor.

TESTS

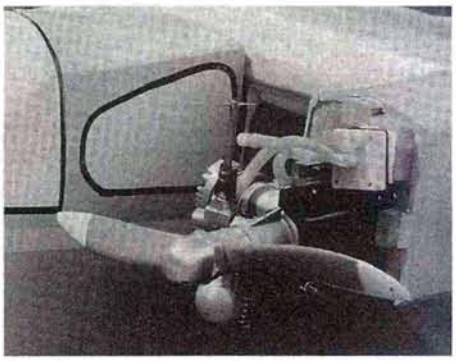
Installing the PCFS is simple. For the first test, I mounted it in a sport airplane with an O.S. .61 4-stroke. I mounted the regulator on the firewall with Velcro®-brand fastener; the check valve in the muffler pressure line and overflow and fill provisions were provided by the supplied connectors. The system is vented while it's filled and sealed for operation. After a few cranks with my electric starter, the tank was pressurized, and the engine started. The needle-valve adjusts the normal mixture ratio. Flight tests showed that the system worked reliably with no tendency to lean out regardless of maneuvers or flight time (tank fuel level).

Because I wanted to use the PCFS in a twin I had been flying, the second test used two O.S. .61 FS engines mounted on a test stand with a single fuel tank 18 inches below the engines. I thought this would be an extreme test of the PCFS' capability to handle remote tank location. Each engine had its own PCFS, but they both drew fuel from a common tank. Again, the engines started after a few spins of the electric starter and ran very strongly and consistently; low idle was especially good.

For the third test, I decided to flight test the PCFS in my twin. The twin has two O.S. .25 FP 2-stroke engines, so I had to remove the backplate and tap each for the 6-32 pressure tap provided. I used Velcro® to mount the regulator on each firewall about 2 inches from the carburetor. Fuel and pressure lines were run from each engine nacelle to common lines, which went to a central tank in the bottom of the fuselage. The lines were about 12 inches long and the tank was 6 inches below the engines. Start-up was easy and both engines ran very strongly and consistently. Three flights were made without any problem; in fact, the engines seemed *more* powerful, although I made no rpm checks. Without the PCFS, you could not have run these engines with the central tank so far from the engines.



Two O.S. .61 FS engines were equipped with the PCFS; they ran very well on the test stand with a single tank 18 inches below the engines. With the PCFS, tank position is not critical, because the system is pressurized from muffler pressure through a check valve.



The PCFS was successfully flown on the author's twin with two O.S. .25 FP engines and a single tank. The regulator was mounted with Velcro® on a sponge-rubber pad on the firewall of each engine.

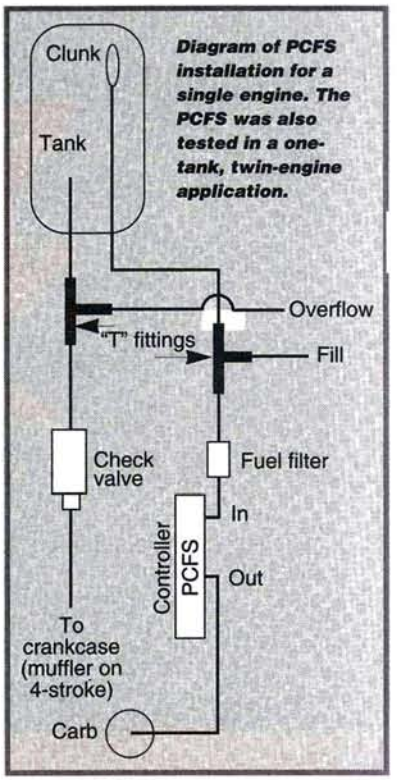


Diagram of PCFS installation for a single engine. The PCFS was also tested in a one-tank, twin-engine application.

If you need to install the tank away from the engine, this $45 system is what you need. Some designs put the tank on the CG, which would be some distance from the engine. The PCFS is particularly useful for scale twins, which often have inadequate space in the engine nacelles for a sizable tank. Installing the PCFS is easy, and the hardware is of good quality. The installation and troubleshooting instructions are comprehensive.

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

MIDWEST PRODUCTS CO.

Starduster

by JOHN, WHITNEY & STEPHEN PHILBRICK

A sport model for eager aerobatic pilots

THIS WAS our first Midwest* kit, but it will not be our last. Midwest advertises the Starduster as a "good second plane" for a beginner. It is. We think it also offers the type of performance that will satisfy experienced sport pilots.

The plans come on two, rolled sheets, and the parts were all carefully grouped in plastic bags. The very well-written, well-illustrated instruction book includes general instructions and tips on hinging, drawings of parts and lists of the materials included and of the tools and materials you'll need to get.

CONSTRUCTION

• Fuselage. This is made of lite-ply parts punched out of sheets; the front and rear halves of the sides are butt-joined, and that joint is strengthened with plywood doublers at the top and the bottom of the sides. Before you start to assemble the fuselage, you drill the engine-mounting holes in the firewall and install the blind nuts. The interlocking fuselage parts are glued together with CA—a strong, perfectly aligned structure.

SPECIFICATIONS

Manufacturer: Midwest
Model name: Starduster
Type: low-wing sport, aerobatic trainer
Wingspan: 60 in.
Wing area: 665 sq. in.
Length: 48 1/4 in.
Radio: Airtronics 6-channel Quasar FM, 4- 94102 servos
No. of channels req'd: 4 (aileron, rudder, elevator and throttle)
Fuselage construction: plywood and balsa
Wing construction: balsa with spars
Weight: 5 lb., 8oz.
Engine req'd: .32 to .46 2-stroke; .40 to .50 4-stroke.
Engine used: .40 HP PDP
Prop used: 10x6 APC
List price: $134.95
Features: excellent plywood cutting, full hardware, rolled plans, complete parts kit.

Hits
- Fuselage's interlocking construction; wing center ribs with mounting tab.
- Ease of tail-surface/wing alignment.
- Landing-gear design (strong, innovative swept-back/ fuselage-mount design).
- Excellent instructions.

Misses
- Plywood wing joiner too large; landing-gear mounting blocks are narrow.

Whitney did the flying while John recorded the event with a Nikon camera. There wasn't any wind, and it was snowing very lightly. The overcast sky made both flight and photography tricky, but still possible. We tested Midwest's claim that this is a perfect "second plane," and we believe that it lives up to that claim.

FLIGHT PERFORMANCE

• Takeoff and landing

We fueled the plane, took one last photo, and fired up the engine. The HP PDP .40 turned an APC 10x6 prop at 11,000rpm. With a trainer-like 19 ounces per square foot of wing loading, I expected good low-speed performance, but I wanted some taxi tests to get an idea of the speed needed for a clean liftoff. But, at about ¼ throttle and 5 feet into the second taxi pass, it was airborne! Caught slightly off-guard, I let the plane continue to gain speed and altitude and begin a shallow climb to the left. Not until I had gained 75 to 100 feet did I realize that I hadn't advanced the throttle past about ½. Subsequent takeoffs were made with a more vigorous use of the left stick, but all were quite comfortable and controllable. The rudder has plenty of control authority during the takeoff roll, and the lightness of the plane should allow even a non-Schnuerle-ported .40 to pull it into the air. The plane easily rotated onto its mains, but had a slight tendency to nose over on our grassy field at the beginning of the takeoff run. Minor use of up-elevator controls this. Otherwise, the takeoff run is very stable. Though some pilots may want a little toe-in in the main gear, we left them as manufactured.

Landing this plane is anticlimactic. Point it at the field, chop the throttle and wait for it to settle in. It has a very pleasant power-off glide attitude, and only a minor flare is needed before touchdown. The sink rate is comfortable, and there's no need to keep any real power on during landing. In fact, give yourself a relatively low idle, or it will just keep flying! The rudder and elevator remain in control until touchdown, and I over-flared the first landing, not expecting as much elevator authority right before touchdown. On the third flight, we had a dead-stick, after handing the radio back and forth among the four of us to get all our impressions. This landing was also anticlimactic. A slightly nose-down attitude kept up flying speed, and the plane glided in for a stable landing.

• Low-speed performance

Because the sky was overcast, we needed to keep the plane close for visibility and for taking photos. This gave me plenty of time to evaluate its slow-speed handling, which was excellent. This is the best feature of this plane. It is stable, it stalls straight ahead at a very slow speed, and it has plenty of control.

• High-speed performance

Though not designed as a speedster, the Starduster was enjoyable and solid at high speed. Full-power dives were straight and in control.

• Aerobatics

This plane is a good aerobatic trainer. It easily loops, rolls, performs Immelmanns and split S's. With only a touch of down-elevator, it maintained inverted flight indefinitely. As advertised by Midwest, the rudder had enough authority for knife-edge flight with minimal roll coupling. The built-in stability and light wing loading will limit some of the aerobatics more experienced pilots might want, but this is a trade-off made with beginning aerobatic pilots in mind. Pilots who want more aggressive performance can move the CG rearward and push their Starduster further than we took ours.

Overall, the Starduster meets Midwest's claim of being a "perfect second plane." Without hesitation, we would recommend it to any R/C pilot who has recently soloed. Its performance is well worth the purchase price, and building it is both enjoyable and instructive.

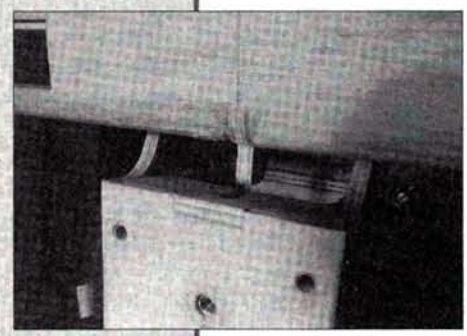
To shape the fuselage at the front and tail requires carving and sanding some blocks of wood. The blocks at the rear also help to ensure that the vertical fin and the horizontal stabilizer are accurately aligned. These blocks extend the slot in the top of the fuselage for the vertical fin; the stabilizer slides into a slot in the sides.

• **Landing gear**. This is innovative. Low-wing tail-draggers often have their landing gear mounted inside the wing in a complex, usually fragile, structure. Midwest avoided this problem by installing a strong mounting block in the rugged fuselage and making it support the rearward-swept metal gear. It is a very clever design. When you drill the holes to attach the gear to the fuselage, be careful, because the mounting block is quite narrow. Following a suggestion from Bob Davis of Davis Model Products*, we shock-mounted the landing gear using the same Iso-Mounts as we used on the engine. This allows the landing gear to "give" more—especially good for less-than-perfect landings. We highly recommend these mounts.

A "bare bones" shot of the plane, showing the swept-back landing gear.

• **The wing.** Its construction is straightforward, though the semisymmetrical airfoil requires that the pre-shaped leading and trailing edges be installed right-side up.

We ran into a problem with the wing joiner, and a call to the manufacturer revealed that others had similar problems. He recommended putting a spacer between the two spars when gluing the shear webs into place. By doing this, you'll have enough space for the dihedral brace (wing joiner) when it's time to glue it into place.



The wing-alignment tab and the mating slot in the fuselage.

We covered the sheeted center section of the wing with fiberglass, extending it further outward than called for by Midwest. Instead of attaching the fiberglass to the sheeting with CA as recommended by Midwest (a very acceptable approach), we used EZ Lam epoxy laminating resin from Aerospace Composites*.

SETUP

• **Alignment**. Very little fussing was required to build a well-aligned plane. The central wing ribs,

A side-view "bare bones" shot.

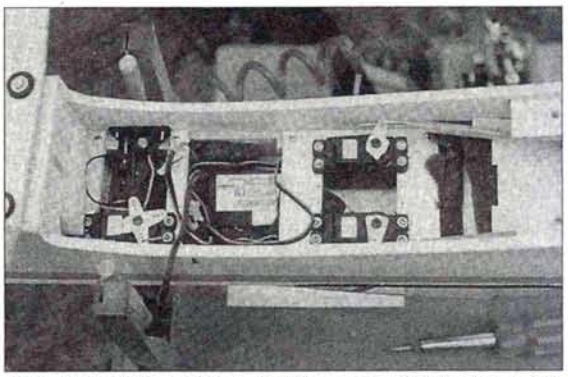
made of light plywood, create a key that mates with a slot on the fuselage. The key and the fuselage required a little touch-up sanding to get the wing to fit in its saddle without applying too much pressure on the hold-down bolts. Once installed, the wing and tail feathers were almost automatically aligned, thanks to the slots described above.

• **Wing attachment**. As shown in the photo, we drilled and tapped the holes for the hold-down bolts with the wing in place. We first drilled an 1/8-inch hole for the first screw, pinned the wing and fuse together with a piece of 1/8-inch dowel, then drilled and tapped the second hole. We inserted a nylon bolt through that hole and tightened it down; then we enlarged the first hole and tapped it. This gave us holes that are in exactly the right places with respect to the wing, and they are at the correct angle to accept the screws.

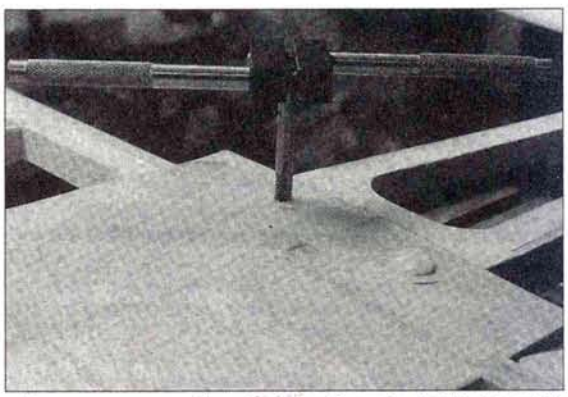
• **Covering and engine installation**. We coated the bare wood with Coverite's* Balsarite and filled the grain of the fiberglass on the wing center section with Stits Feathercoat from F&M Enterprises*. Then we covered the plane with CGM's* Ultracote.

With a well-broken-in HP .40 PDP (distributed by RJL Industries*) installed, the model's finished weight came out at 5½ pounds. To reduce noise and vibration, we mounted the engine in a Hayes* fiberglass mount and attached it to the firewall with Iso-Mounts. Our 10-ounce fuel tank is by Du-Bro*.

• **Radio installation and balancing**. We installed the radio and servos after covering the plane—the opposite order to that suggested by Midwest. This allowed us to move the radio components around to balance the plane. Midwest supplied control rods of plastic tubing running inside plastic tubing, with short threaded wires CA'd into the ends. Though this is simple and provides a good connection between the servos and surfaces, we shortened the wire in the inner tube both to save weight and to prevent it from binding where the pushrods exit the fuselage.



This view of the spacious radio/servo compartment shows the position of the electronics chosen for balance and to avoid interfering with the aileron servo on the wing.



To ensure screw alignment, tap the wing-bolt holes with the wing in place.

The Starduster kit is of superior quality, and building and flying it gave our family many hours of enjoyment. We're looking forward to campaigning it for some years, and we recommend it highly.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

MODEL AIRPLANE NEWS HOW TO

by DAVE PLATT WITH ILLUSTRATIONS BY JIM NEWMAN

Covering and finishing secrets from the master

Fabric-Covered Aircraft

AFTER MANY years of building scale models, I've come up with various methods for the covering and finishing process. The one that you choose depends on your model. Although I have given step-by-step suggestions here, I don't intend to imply that these are the only ones that work. Variations can be made without risking disaster, and if you've developed techniques that work well for you, it may be best to continue with them. If, however, your experience is limited, or covering and finishing have always given you a hard time, I suggest that you follow these steps without modification. You'll be starting out with a proven method, and you can devote your attention entirely to improving your skill level.

Here we see a colorful deHavilland Tigermoth. It's typical of a fabric-covered aircraft and will present the modeler with much surface detail to duplicate. (Photo courtesy of Scale Model Research.)

MATERIALS

I've been involved with model building for many years, and I've seen more "new and miraculous" ways of covering and finishing a model than there are P-51 kits on the market. A few of these have stood the test of time; many haven't. Some have useful applications in other areas of modeling, but they don't give good results on scale models.

• **Plastic films.** Super MonoKote* is extremely useful as a parting film for making fillets, fiberglass landing-gear doors, etc. Other than this, films should be avoided for covering a scale model. Plastic film invariably wrinkles and lifts off the model's surface. I feel that Mylar imparts a "toyish" look to a scale model. Plastic does have a good gloss (perhaps too good), but if you're reproducing a glossy subject, there are better ways, as we shall see.

• **Silkspan (a rag paper).** Probably the oldest and most traditional of all coverings, silkspan is still very useful to scale modelers. It's light, easy to work with, resilient and inexpensive. On the minus side, it is, of course, weaker than nylon and requires the use of dopes, which I prefer to avoid. I use silkspan on fabric-covered control surfaces.

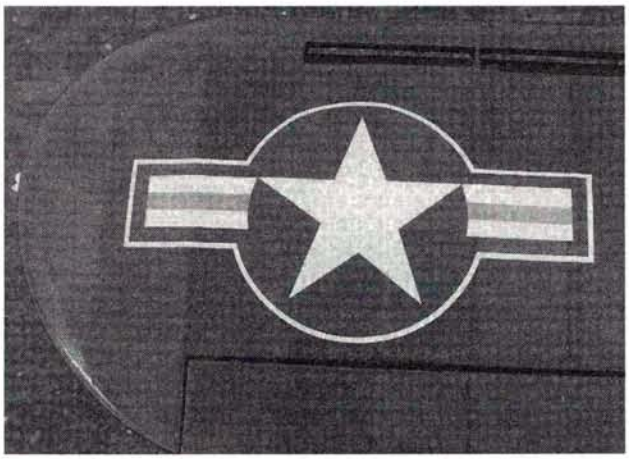
• **Silk.** Silk is useful mainly when applied over a base layer of silkspan. Silk alone does not do an entirely satisfactory covering job. This is because its open weave allows too much dope to soak through; this forms drops of dried dope on the inside of the silk. Needless to say, the appearance is terrible.

• **Nylon.** Nylon, which has none of the problems of silk, has a close weave that prevents dopes or paints from penetrating too far. Dacron and other man-made fibers fall into this category. For covering a fabric-covered model, polyester is very suitable. This is sold at fabric stores as a lining material; it's inexpensive and very strong.

• **Coverite*.** This is a man-made fiber with an adhesive backing; it's heat-shrinkable and should be ironed on. It's expensive, but when you follow the directions that are supplied, it's also a fine product that will produce very good results. Although its manufacturer suggests that you don't use nitrate dope on Coverite, my experience indicates that this isn't a problem.

• **Sig* Koverall.** This uncoated, heat-shrinkable polyester fabric has no adhesive and is not expensive. To stick it to a model, you can use dope in the traditional silk-and-dope method, or you can use Sig's Stix-It heat-activated adhesive.

• **F&M Enterprises*.** This company has a product called "Scale Stits Covering," which is very similar to full-size aircraft covering material. The material is glued to the model with a heat-activated adhesive called "Poly Tak."



Rag wings are full of details, such as rib stitching and pinked tape. The larger your model, the more important these details are to its appearance.

THE COVERING PROCESS

The covering material you have chosen will be one of two kinds: iron-on, heat-shrinkable (Coverite) or one of these fabrics: silkspan, polyester, silk, or nylon. In the early stages of covering, the methods vary somewhat. For Coverite, follow the detailed instructions supplied with the material. An imperfect covering job with this product is almost always the result of not reading or following the instructions. Take special care with the grain direction, or a loose covering job can result. Once you have the ship

covered and are ready for finishing, switch from the manufacturer's instructions to those described here. For silkspan, polyester, silk and nylon, proceed as follows:

1 Sand the airframe very carefully at all points of covering contact. Use 220-grit aluminum-oxide paper. Fill any dings with a microballoons/K&B* resin mix (or vinyl-spackle paste), and sand out. Be very fussy with this job; the final appearance of the finished model depends on it.

2 Brush a coat of full-strength, clear nitrate dope over all areas where the covering will contact wood. Allow to dry.

3 Lightly sand off any "fuzz" with 220 sandpaper, and apply a second coat of clear. Allow to dry; then repeat the sanding.

4 Cut the covering material a little oversize. Soak it with water, and then squeeze out the excess (leave the material only damp). Now, working as quickly as possible, smooth out the damp material over the area to be covered. Gently tug out any wrinkles. Do not be particularly concerned to get the material drum-tight, but be sure to get it smooth and wrinkle-free.

5 Brush a coat of nitrate dope onto the covering material, but only where it contacts the wood. As the damp material and the dope dry, the covering should adhere well and shrink fairly tightly.

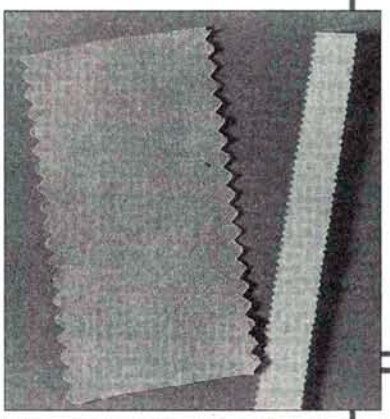
6 Inspect the results. Any imperfections (wrinkles or obvious looseness) can be dampened and doped again. Only when the job is perfect can you proceed. *Do not* expect later coats of dope to improve a problem area! The covering job will never be any better than it is right now. If, in spite of extra attention, problems with wrinkles remain, remove the covering material, and try again. You may have areas of blushed (white) dope; this is a normal reaction of dope and water.

The following steps apply to the fabric covering, and they should be followed after the Coverite has been applied according to manufacturer's instructions.

7 Brush, or better yet, spray a coat of thinned, clear dope over the completely covered model. As this coat dries, the covering should gain a little tightness and some of the blushed effect will disappear. Lightly sand the entire model with 220 paper.

8 If you're double-covering (silkspan), this is the time to apply the second layer of material. Wet the material and cover, using an overall coat of clear as adhesive.

9 Now apply three or four more coats of clear (use spray if possible). The last coat should be well-thinned (25 percent dope, 75 percent thinner).

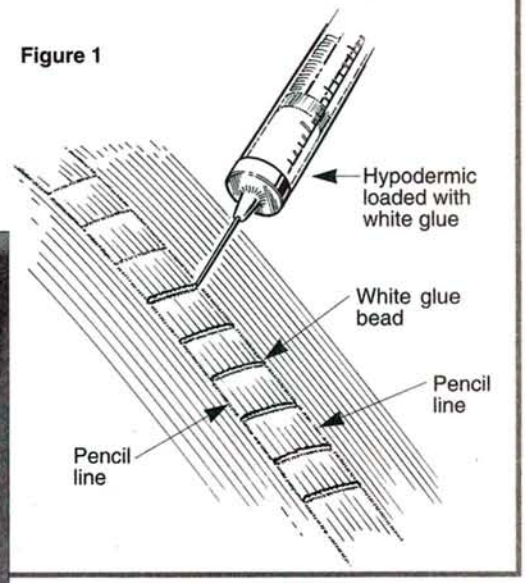


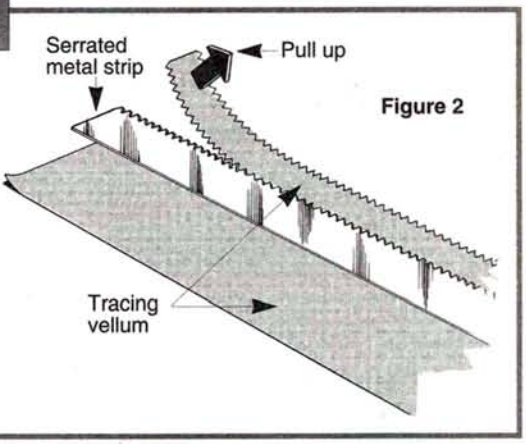
This is a sample of Clearprint 1000H draftsman's vellum that has been pulled up against the serrated strip of a Saran Wrap box. Placed next to a full-size sample of 2-inch-wide pinking tape, if you count the points, the strip of vellum is almost exactly 1/4 scale!

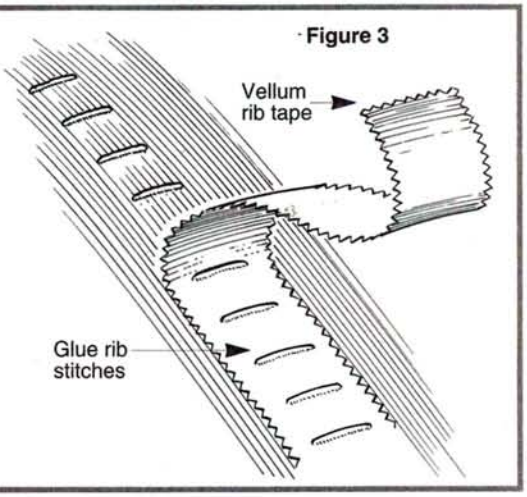
PRIMING

The covering and clear doping having been completed, lightly sand the model in preparation for priming. The primer must be sprayed on for the best results. When the primer is dry (two hours for Du Pont no. 100S; overnight for K&B), sand very carefully. It is advantageous to use 220- and 320-grit silicon-carbide wet or dry sandpaper on the primer. Use it wet to prevent the paper from becoming clogged. Remember the surface quality you're now seeing represents the quality of the final job; the color coats will not correct surface imperfections. If there are any flaws, attend to them now with extra primer or filler, and sand them out.

Below is the process of duplicating rib stitching and pinked taped as mentioned in the text. Illustrator Jim Newman gives credit for the original idea in 1973 to Keith Ward of Elmhurst, IL.







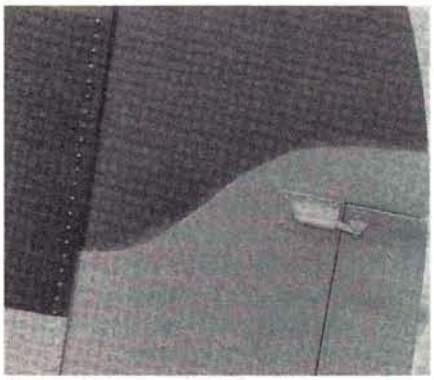
SURFACE DETAILS

By now, the model should be looking great. At this time, add surface details, such as rib stitching and tapes, as required.

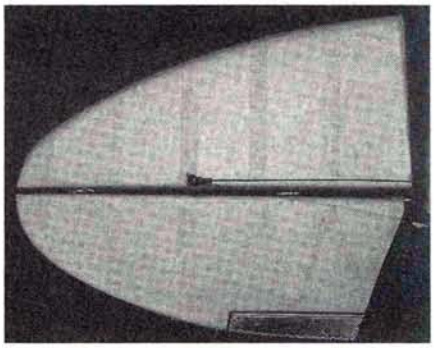
• **Rib stitches.** These are best represented by Elmer's white glue applied in thin lines across each rib at a suitable spacing. The glue is applied with a hypodermic needle.

• **Rib tapes.** A number of methods have evolved. My favorite uses the serrated cutter from a wax-paper or plastic-wrap package to cut strips of paper (tracing vellum). The strips are soaked in water until they become

FABRIC-COVERED AIRCRAFT



This close-up of the rudder on Sepp Uberlacher's Tempest shows that fabric covering is also required for heavy-metal warbirds. Many WW II fighters and bombers had fabric-covered control surfaces.



Stabilizers need rib-stitching detail to make the fabric covering look correct.

limp and are doped down over the glue "stitches." An additional coat or two of clear dope will make the paper ready for color.

PAINTING

When you have the colors you need, paint the model. For the best effect of realism pay close attention to the degree of gloss you need. Many full-size aircraft are matte or satin finishes. In these cases, use the satin part B. Even in cases where the prototype is "glossy," it's unwise to use straight gloss part B. Very few full-size subjects have the rich, deep gloss that model epoxy paints normally have. A much more convincing effect is produced by dulling the shine to some degree by pre-mixing the gloss hardener with 10- to 20-percent satin hardener.

Covering and finishing a scale model can be as absorbing and as pleasant as any job that our hobby has to offer. Using this process will at least get you started in the right direction for a good-looking, successful covering job. Good luck.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

by MIKE LACHOWSKI

FOAMERON FUN & CALYPSO CONTEST

Foameron and radio ready and waiting for flight.

THIS MONTH, I have a mini-review of the Foameron slope glider for those who like things inexpensive and simple. Hey, it doesn't even require any glue to build this one. For those with a more refined taste in soaring, I'll tell you about the Calypso Contest, which is made in Great Britain.

FOAMERON SLOPE GLIDER

You may not want to take your best model out to slope sites that have rough terrain, but you don't want to give up performance either. The Torque and Recoil Club* Foameron, which sells for $69.95, might just be what you're looking for. It's a simple design, and it performs quite well with the RG14 airfoil. It's made of foam and tape, a few plywood parts and some arrow-shaft spars. No bagging or even gluing is required during assembly.

TAPE, TAPE AND MORE TAPE

First, remove any "fuzz" from the wing parts. Tape on the wingtip rib, and slide in the arrow-shaft spar. Now the wing gets "sheeted" with 2-inch-wide filament tape. Clean the cores and your work area before working with the tape just as you would before covering a model with film. You don't want dust and dirt to leave bumps. For a smooth wing, carefully align the tape strips edge to edge, and avoid overlaps. The hardest part is wrapping a piece of tape around the leading edge. Don't try to stretch the tape. Use a new knife or razor blade to do the trimming. (Don't use scissors; they get gummed up by the tape, and they cut poorly.)

Next, apply the vinyl sheeting over the tape. I thoroughly cleaned the area, cut the vinyl to size and placed the piece on top of the wing. Work your way out from the center of the wing, and you should get a nice, smooth covering job. Another option suggested in the manual is to spray the vinyl with just enough water to wet the back. Smooth out the covering, and wait overnight for the water to evaporate. Complete the wing by taping on the root rib and applying some additional vinyl to cover the tape. The whole process can take as little as one hour.

The tail consists of simple, precut plastic pieces that look like corrugated cardboard. Cutting one side of the surface gives you an elevator. Trim the edges with some electrical tape, and add the elevator-control horn.

You'll spend the most time on the fuselage. You'll have to rout out the sides to inset the plywood fuselage doublers. I used a Dremel with a router attachment. You could also use sandpaper for this job. To make a sanding fixture, mount a narrow strip of sandpaper raised 1/8 inch on a larger board. Sand in around the edges first, and then sand until the larger board touches the fuselage. Now you should have your 1/8-inch-deep slot.

Another bit of foam cutting is required for mounting the radio. The kit includes some wire to make a cutting tool that mounts on a soldering gun. Soldering guns make great foam-cutting accessories. If you haven't done this before, then practice on the core beds first. To cut the mounting holes, you could use a Dremel tool, but you may find that the tool isn't long enough. The trickiest cut you'll make will be for the wing linkage. There isn't much foam left in that area of the fuselage once you've finish cutting. After you've cut all the slots and pockets, sheet the fuselage with filament tape, just like the wing. Wait until you complete your radio installation and elevator pushrod before sheeting with the vinyl. The only bad part about the tape and vinyl is that the nose will look ugly. There just isn't any way to get a smooth fuselage with the stuff. Don't worry; it will get worse with a few rough landings, but it will keep on flying.

I spent about 4 hours building the whole thing. You can see the filaments in the tape through the vinyl, and the square fuselage with tape is plain ugly up close but 10 feet away, it isn't an issue. With a wind forecast of 15 to 25mph from the northwest, it was time to make a trip out to Chickies Rock in Columbia, PA, and give it a toss. The first flight was just fine; just a little up-trim to compensate for a slightly nose-heavy CG. After some flight shots, I passed the transmitter to another pilot to give it a try. Five

I'm ready to toss the Foameron out for its first flight. The tree line along the slope creates a nice dead area behind it for landing parallel to the slope.

SPECIFICATIONS

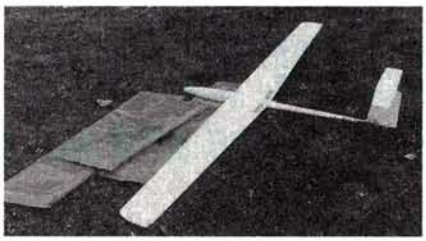
Name: Foameron
Manufacturer: Torque and Recoil Club
Type: Slope Glider
Wingspan: 60 in.
Wing loading: 9 to 12 ounces per square foot, adjustable by changing wing rods (three included).
Airfoil: RG14
No. channels: 2 (wingeron and elevator); JR341 servos and 6-channel credit-card RX, 600mAh 5-cell battery pack; standard servos will fit.

Features: complete kit includes foam wing cores and fuselage, precut ply parts, all hardware, vinyl wing and fuselage covering, plans and instructions. You don't even need glue!

minutes later, I heard a call for help and saw the model going down the slope to an area you can't see. The first landing ended up in a tree on the slope, but damage was minimal; some of the vinyl was missing on the leading edge where it had hit the tree. The vinyl cracked in the cold, but it was still flyable and no repairs were needed. I don't think this is the way flight tests are supposed to be done, but maybe it's appropriate for this model.

After a CG adjustment, the Foameron was back in the air and flying. The roll response is good with the wingerons, providing you have enough surface throw. If you're not used to a wingeron model, the amount of movement on the trailing edge looks pretty radical. You want at least ½ inch each way. The RG14 airfoil allows the plane to move fast even at lighter wing loadings, and it handles well in inverted flight. It's a fun, quick-building slope model.

Joe Galletti of the Torque and Recoil Club stands behind the Foameron and offers a product guarantee: if you mess anything up during construction, Joe will replace it for free! Also, Joe takes customers' comments and suggestions to heart and is constantly updating the instructions (a good suggestion will get you a free kit). An optional wing rod ballast is available and, if you send Joe your receiver and two servos (Joe has custom-made receiver battery packs available), he'll build you a ready-to-fly, out-of-the-box version of the Foameron for $160 (including shipping). For more information on the Foameron, call Joe at (512) 454-0061 or on the Internet at Foameron@aol.com.



CALYPSO CONTEST

On the other end of the spectrum from the Foameron is the Calypso Contest from Model Technology in Great Britain. Distributed by Slegers Int'l*, this RG-15 F3B model features molded construction, and it has some of the best workmanship I've ever seen on a molded model. It requires very little work beyond radio installation to get this model into the air. I borrowed the model from Slegers for a closer examination. Ready to fly, it will be in the mid-80-ounce range and have a wing loading around 12 ounces per square foot. It's a little fast and heavy for AMA-style thermal competition, but it looks like an excellent F3B or windy-weather F3J model.

The wing is three-piece, but it's hard to tell from 10 feet away. The joints fit so well that you can hardly see them. Tips plug in using rectangular carbon-fiber joiners, and they also have alignment pins installed. Ailerons and flaps hinge on the bottom surface, and the control horns are already mounted on the top surface. Fairings over these horns are molded into the very stiff wing. The skin sandwich uses balsawood so it should be more durable than the Rohacell foam used on some other models.

I really like the T-tail and rudder linkages. The rudder uses pull/pull cables, and hardly anything sticks out, which keeps the fuselage aerodynamically clean. A rocker is used for the T-tail elevator linkage. The elevator horn is a piece of wire. This wire slips into a ball link on the short pushrod on the top of the rocker, making the stabilizer removable for quick and easy transportation. The padded plastic bags that were used to ship the model can be re-used to transport your model to the field. If you're looking for a really nice molded model, check out the Calypso Contest..

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

SCALE DOCUMENTATION

The 1996 edition of Bob Banka's "Scale Aircraft Documentation and Resource Guide" is now available. Bob has added a number of items of interest to sailplane pilots, such as a separate section on 3-view line drawings of gliders and sailplanes and a section on powered gliders. With these drawings and more than 250 Foto-Paaks, you should be able to find some excellent documentation. Of course, there are thousands of other powered-aircraft drawings and photos for the power-slope-scale modeler, too.

Another good source for material is the National Soaring Museum (NSM), located on Harris Hill in Elmira, NY. If you're in the area, be sure to check it out. You can help support the museum with an individual membership of only $25. As a member, you'll have free admission to the museum, and you'll receive the "NSM Journal," which contains articles of historic interest and the quarterly "NSM News."

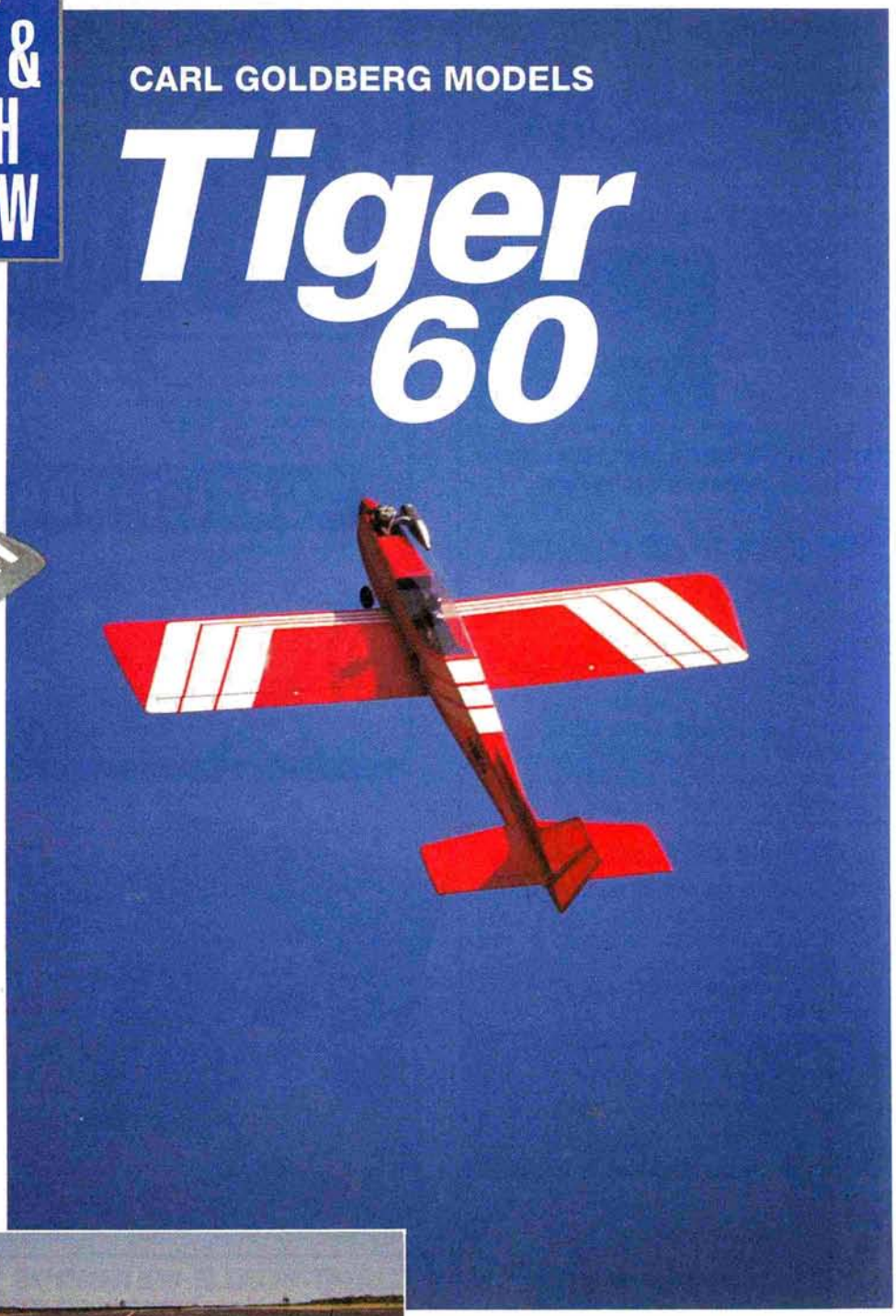
MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by ROB WOOD, PAUL KLAHN & BRYAN KEIL

CARL GOLDBERG MODELS

Tiger 60



THE TIGER 60 is another of the easy-to-build, great flying airplanes I've come to expect from Carl Goldberg Models*. Billed as a low-wing trainer (or "second" trainer, to be specific), the Tiger 60 lives up to its description in that its construction is very well thought out. Much of the fuse

This low-wing trainer is GRRRREAT!

can be assembled with rubber bands prior to gluing, and the model exhibited no unpleasant habits during test flights. In fact, the Tiger 60 was capable of performing most of the basic aerobatic routines we attempted, and the few discrepancies we found in the building instructions were easily overcome.

CONSTRUCTION

If you haven't built any of the other Goldberg kits, you're in for a real treat. All the wood in the kit was obviously chosen for its high quality and strength, and if there is any criticism on that score, it would be that they erred too far toward strength, and not far enough toward keeping the weight down. A trainer must, of course, strike a balance between the two, so it's a matter of opinion as to which side of the line is best.

• **Fuselage**. The die-cut lite-ply fuselage parts were so perfectly cut that they fell out of their sheets when we lifted them; a word to the wise: handle carefully. The rough fuse assembly took about 45 minutes, and the interlocking pieces made pre-assembly a snap.

• **Tail**. The tail feathers were easy to assemble, although we found them to be somewhat heavy (read strong), and that weight ultimately made the plane tail-heavy. We had to move the battery forward and

install it under the fuel tank. You might want to roughly place all the onboard equipment in the indicated positions before installing it permanently. This is a tried-and-true way to avoid having to make unnecessary modifications later on to achieve the proper balance.

• **Wing**. The Tiger wing is also made of die-cut parts and again, the cuts were close to perfect, and the fit was superb. Before completing the wing, you might want to consider beefing up the wire main-gear attachment points. Depending on your flying skills, hard bouncing might wreak havoc on the gear installation. One slight modification you might try is to take a bit of the scrap lite-ply and build up the gear platform to the level of the spar, then use more of the scrap to tie the platform to the spar; this is not necessary though.

• **Sanding and finishing**. True to Goldberg standards, the kit includes various wooden sanding and shaping tools. The 45-percent bevel tool needed a 3/8-inch shim to work properly, because there isn't quite enough sandpaper to begin sanding the part to shape. Also, the rounding tool didn't work as well as we would have liked, because it dug grooves into the flat surface of the part we wanted to sand. With tools such as these, always practice on scrap, so that you don't damage the actual parts.

The kit comes with all the basic hardware you'll need, but as with all model-building projects, some hardware might not suit your personal tastes. For example, the size of the model would suggest the use of metal clevises of the Sullivan* Gold-N-Clevis type, instead of the nylon clevises provided. We also objected to the use of a 0.060-inch wire with metal connectors for the throttle linkage, because we have learned to avoid "metal-to-metal" contact wherever possi-

FLIGHT PERFORMANCE

• Takeoff and landing

The ASP .61 fired right up, and after richening the high-speed needle a few clicks, the engine ran steadily with the Tiger 60 in a vertical position. Now it was time to fly. The aircraft tracked nicely down the runway, and lifted off in approximately 60 feet. Bryan reduced the throttle to 50 percent and trimmed the Tiger with one click left for the aileron trim and one click left for the rudder. This gave us a hands-off neutral flight attitude.

Landing was set up in a standard left-hand approach, chopping the throttle produced a gentle glide, and the aircraft tracked straight down the runway for a three-point landing.

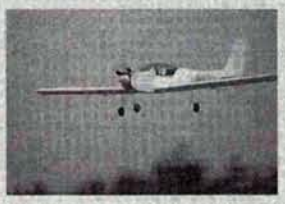
Test pilot Bryan Keil checks the controls for proper throw and direction. It's always a good idea to have a buddy run through this procedure with you before any maiden flight; adrenaline and careful preflight analysis don't mix very well!

• Low-speed performance

Excellent, with more than adequate aileron authority.

• High-speed performance

ASP .61 ABC provides more than enough power at ½ throttle for most basic IMAC maneuvers. Aircraft showed no pitch changes throughout the throttle range.



• Aerobatics

General tracking characteristics—straight and true with hands-off.
Vertical performance with the ASP .61—modest but acceptable. Required slight right rudder and up-elevator to maintain perfect vertical attitude.
Inverted flight—minimal down-elevator required. ¾ loop (square backside)— Crisp and clean.
½ Cuban-8—excellent, with moderate roll response (could use more aileron throw).
Immelmann—excellent tracking, moderate rollout on top.
Two-point roll (3 seconds)—excellent, with very little elevator and rudder input needed.
Split S—excellent, tracked nicely.
½ Reverse Cuban-8—smooth and predictable.
Inside loop—tiny right rudder required for straight tracking.
Hammerhead—slight right rudder input for acceptable hammerhead.
Humpty Bump with a pull, ½ roll down—excellent.
Cuban-8—excellent.
Knife-edge flight—needs more rudder throw.
Slow roll—very smooth with minimum elevator and rudder input.
Rolling circle—acceptable.
Spin—did not want to stall, an excellent trainer.
Tail slide—tends to fall over onto its back, but this may be a function of tweaking the trim settings.

Comments: this airplane is designed for the beginner to intermediate builder who wants a painless introduction to low-wing aerobatic and fun-fly maneuvers. It is extremely stable, yet if you open the throttle, you can burn holes in the sky with the best of them.

SPECIFICATIONS

Manufacturer: Carl Goldberg Models
Model name: Tiger 60
Type: low-wing, stand-off-scale plane
Wingspan: 70 in.
Wing area: 855 in.
Wing loading: approx. 21 oz. per sq. ft.
Airfoil: fully symmetrical
Flying weight: 6.5 to 7.5 lb.
Length: 55.5 in.
Rec. engine: .45 to .65 2-stroke or .65 to .80 4-stroke

Engine used: ASP .61 ABC
Radio req'd: 4 channel with 5 servos—aileron (2), elevator, rudder, throttle
List price: $169.99
Kit construction: pre-cut balsa and lite-ply, built up

Features: the kit features precisely die-cut parts of exceptional quality; an interlocking structural design; a complete hardware package; excellent instructions and drawings; and sanding and beveling tools.

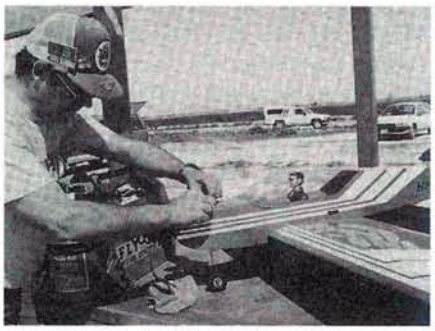
Hits
- Quick and easy to build.
- Attractive, sporty appearance.
- Interlocking design ensures straight and accurate construction.
- Excellent instructions and drawings.
- Precision-cut, high-quality wooden parts.
- Excellent flying capability.

Misses
- Tail-feather wood is too heavy, and that results in a tail-heavy plane.
- Sanding and beveling tools need some modification.

ble; this is a precaution against RF interference. We replaced the metal connector at the carburetor with a nylon ball link. We also substituted arrow shafts for the basswood pushrods. This was simply a matter of preference. All in all, the hardware package was well suited to the scope of the project.

We finished the model with Ultracote. following the design on the box, and although it came out very well, the instructions and plans were vague on the subject. We'd like to see some dotted lines on the plans and a more thorough "how-to" treatment in the manual.

This airplane is designed for the beginner to intermediate builder who wants a painless introduction to low-wing aerobatic and fun-fly maneuvers.



Builder Paul Klahn makes last-minute preparations before the maiden flight. Paul was chosen as the builder because his skill level matches the intermediate level Goldberg recommends for this kit.

After we had installed an ASP* .61 ABC engine, receiver, receiver battery and servos, the Tiger 60 was still tail-heavy. After moving the 4-cell, 550mAh battery pack forward, we still needed to add about 6 ounces to the nose for balance.

CONCLUSION

Except for a few minor details, this aircraft is exceptional both in the quality of its parts and its flying capabilities. For the R/C'er who has a little experience, the Tiger 60 is a great second aircraft. We had a good time with this plane, and we bet you'll have the same experience. Check one out, and have some fun.

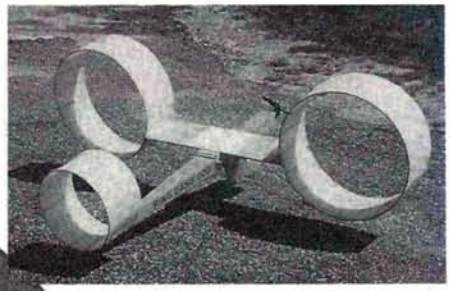
** Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

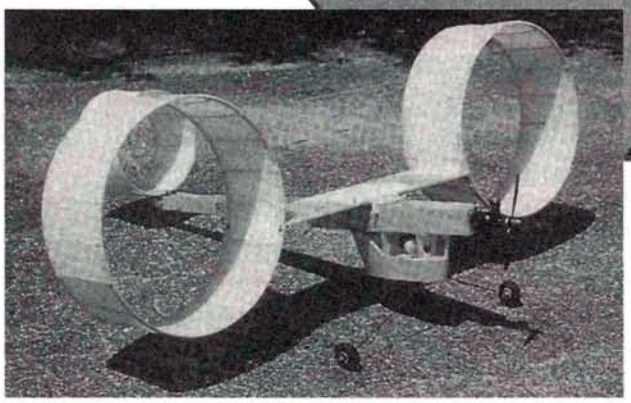
by ROY L. CLOUGH JR.

MODEL AIRPLANE NEWS
CONSTRUCTION

Ringer

What's all the "hoop" -la about?





IT LOOKS LIKE the courtship dance of a pair of lampshades, or like a time traveler from a future that has outrun our ideas of common sense, but the "Ringer" is a novel design that has its roots firmly planted in one of the oldest notions of how to build a flying machine.

Aircraft with annular airfoils (or lifting drums) instead of conventional wings have been theorized, proposed and actually built since around the turn of the century. Early-bird Danish pioneer Ellehammer tried to fly one. (He had better luck at a later date with a more conventional design.) Louis Bleriot actually did fly a somewhat diluted version—a flattened oval annular-wing tow glider on floats. Ellehammer's full-scale machine wasn't a success, but the method of control he proposed—"slewing" a lifting drum—worked well on this model.

Ringer gets noticed. My fellow members of the Winnipesaukee Radio Controllers quit flying their own stuff and gathered around when I fired it up. Their rapt attention as it maneuvered around the sky and their round of applause when it landed made the whole project worthwhile. Of course, there were a few remarks I could have done without, such as, "It's good to minimize wingtip losses, but this is ridiculous!" and "Oleg Cassini is going to be very annoyed by what you've done with his lampshades."

Seriously, though, Ringer *is* extremely stable. It handles well under power and has a decent glide. Towed around by a Cox* Black Widow, it's an eye-catching performer and if you feel burdened by a reputation for excessive sanity, Ringer will get you off the hook.

This isn't my first annular wing. In a previous incarnation, I built a free-flight annular wing for *Popular Mechanics* (see "Hoopskirt"—April, 1963). It flew well with a Cox .02 reed-valve engine. Judging by the mail I received, it was a popular item, but I did get a few squawks that the circular wing spars were a nuisance to make. Well, Ringer's spars aren't difficult; they come "prefabbed." They're made of wooden embroidery hoops, which are available in most craft shops.

Just about every model I design has at least one key ingredient I'm proud of. For Ringer, it's the smooth, responsive control system. It even lowers the model's tail to increase the wing angle of attack for takeoff! Scratch-builders might want to give further consideration to the control linkage, which could be used to work the "cruciform" tail of a scale Santos-Dumont "Demoiselle," or designed into gimballing tail feathers for your latest original. You could even try an annular drum instead of the usual tail surfaces on something conventional. For soaring gliders, it could be used to operate a V-tail without a complex linkage or mixer function.

CONSTRUCTION

A good point I discovered: the more radical the model, the more conservative the construction. Ringer has a sheet-balsa fuselage covered with iron-on film. Build the cabin/landing-gear unit separately. Cabin sheathing is manila file-folder material; it's easier to work around curves than sheet balsa, and it takes iron-on coverings very well. "Major Pong," my faithful test pilot, was ensconced behind the acetate windows of the original. If you prefer, it's simpler to cover the entire cabin with folder stock and indicate the windows in a contrasting color.

• **Wing.** The four annular wing spars are made of two, 14-inch-diameter embroidery hoops. One of each pair is solid and requires only rounding on one edge. The other hoop is open-ended and joined with a screw clamp. Remove the clamp by carefully drilling out the rivets. (Don't discard the screw clamps; they make great stabilizer adjusters for larger planes.)

Squeeze the open hoop down to the same diameter as the solid one. Make a diagonal cut through the overlap with a razor saw. Line up the diagonal cuts, and epoxy or CA and thread-wrap the joint.

A good point I discovered: the more radical the model, the more conservative the construction.

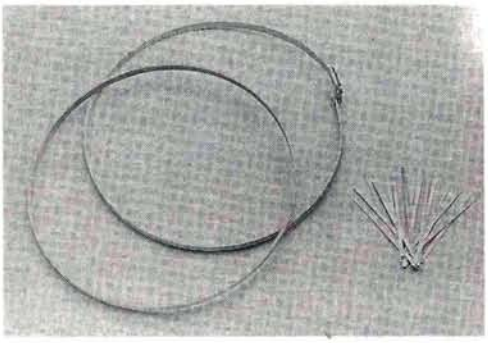
SPECIFICATIONS

Model name: Ringer
Designer: Roy L. Clough Jr.
Type: annular-wing sport flier
Length: 39 in.
Weight: 28 oz.
Span between hoops: 44 in.
Engine size: .049
No. of channels req'd: 2 (elevator, rudder)
Prop: 6x3
Airfoil: annular

Comments: circular wing spars made of 14-inch-diameter embroidery hoops provide strength and structural integrity to this unusual, though stable, model. Its smooth, responsive control system even lowers the model's tail to increase the wing's angle of attack for takeoff. Ringer will prove to be the steadiest plane you've ever flown.

The stabilizer (moving control drum) front and rear spars are made by razor-sawing the solid hoop into two rings.

I had this great idea to make the wing ribs of the original model by gluing wooden coffee stirrers to both sides of the wing spars and inserting small balsa blocks to bulge them into symmetrical sections. It worked; if you have a lot of time to waste, you can build them this way, too. A much better way is to cut out 36 symmetrical 1/8-inch-sheet-balsa ribs for the wing drums and six flat-bottom ribs for the bridge. The tail drum's flat section requires 12, 3/16-square-inch balsa ribs. Sand the ends down to spar thickness.



The four annular wing spars are made from 14-inch-diameter embroidery hoops. See article on the technique for joining the ends of the hoop. The coffee stirrers can be used as ribs, but the procedure for installing them takes a considerable amount of time.

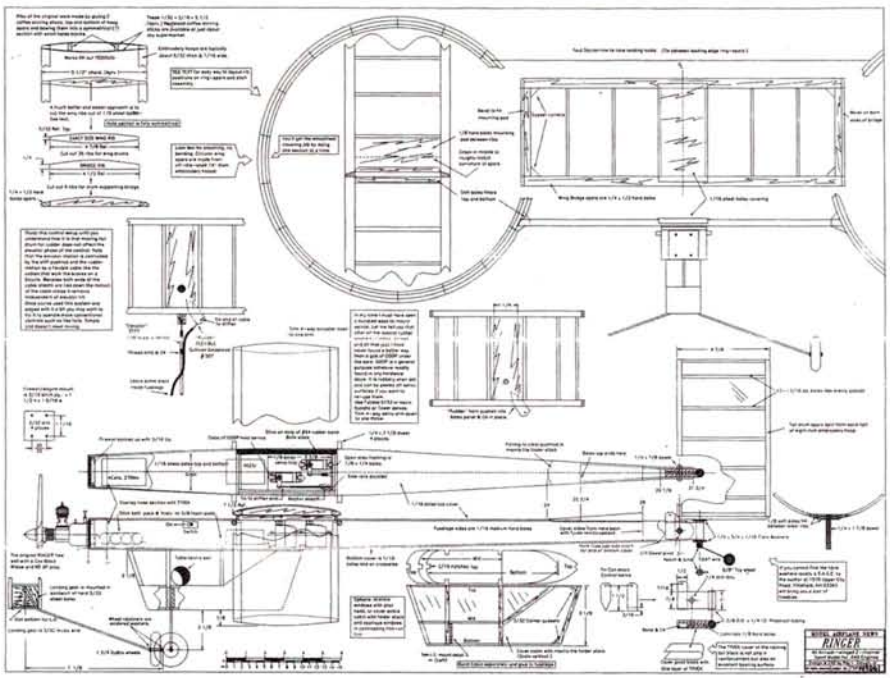
Wing assembly starts with matching two wing ring spars by sliding them around until they are even with each other. They probably won't be absolutely, perfectly circular—no sweat. A little out-of-round won't hurt anything if both spars are in line on the leading and trailing edges. (To keep track of alignment, make "witness marks" in red on both spars.) The easy way to determine rib positions is to lay out a 14-inch-diameter circle on a piece of cardboard and divide it into 18 sections. Cover it with a sheet of wax paper, lay the hoops over it, and pencil in the rib positions. Start with three ribs 120 degrees apart stuck on with fast-drying CA. Lay the other hoop spar atop the end of these ribs (centered and held in place with books, fuel cans, or whatever is handy), and tack it into place with more fast-drying CA. After you get to this point, the rest is easy. Add the remaining ribs in opposing pairs, and true up the drum structure as you go. The wing drums are identical. The tail drum, with its 12, 3/16-square-inch rib struts, is assembled in a similar fashion.

When all the drum frames have been assembled, glue in the 1/8-inch, sheet-balsa mounting inserts. Note that these are cracked midway to conform to the curvature of the spars. Then make up the "bridge" wing. Trial-fit the lifting drums, but cover the three pieces separately before joining them. I covered all flight surfaces with silkspan, one bay at a time—a very smooth surface and only slightly tedious to do. I "water-shrunk" the material and finished it with clear dope. You could also use any light covering such as Litespan* or Micafilm*. Assembly of the wing unit should be clear from the plans. Do not omit the string between the top of the wing drums; it takes landing loads off the joints between the wing drums and the bridge.

• **Controls.** Study the simple control hookup and, before you start, understand how and why it works. I tried several versions before I figured out how to achieve the elevator motion without disturbing the rudder setting and vice versa. The answer turned out to be simple: the elevator is actuated by a solid pushrod, and the rudder is worked by a flexible, sheathed cable in the same way as a bicycle brake. Sullivan* Gold-N-Rod works fine. It's very important to have plenty of slack between the two tied-down ends of the sheath. One end of the sheath is bound and CA'd to the tail end of the elevator pushrod; the other end is solidly glued to the servo bulkhead. Tin 1 inch of both ends of the cable to stiffen them so they can be formed into Z-bends. The hardwood dowel pivots must operate smoothly without binding or wobbling appreciably.

I hand-launched the original for its first flights, but a rolling takeoff is more impressive. Balanced at the right spot and with true surfaces, Ringer will prove to be the steadiest plane you've ever flown.

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.*



ORDER THE FULL-SIZE PLAN...SEE PILOTS' MART.

MODEL AIRPLANE NEWS
HOW TO

Planning a Scale Contest?

Here's a formula for success

by CLIFF TACIE

Editor's note: this article was reprinted courtesy of Bob Banka Scale Model Research.

WHAT'S THE RIGHT way to run a great R/C scale contest? It has to be well-planned, effectively orchestrated and a pleasant experience for all who attend; simply put, the contest must offer what the competition-oriented scale modeler is seeking. The "three Ps"—planning, preparation and presentation—apply to both the scale competitor and to a well-run scale contest.

PLANNING

Planning for a contest begins well in advance, sometimes as much as a year ahead. To ensure success, it's important to make decisions early.

• **When?** Talk to other clubs in your area, search the contest calendars in magazines, and use the services of the Academy of Model Aeronautics (AMA) to select a date that doesn't conflict with other popular scale contests or fly-ins in your area. You don't want potential contestants to have to choose between your contest and someone else's. Obviously, you should also avoid times such as your area's monsoon season.

Will it be a one- or two-day contest? Most large contests, such as the U.S. Scale Masters qualifiers and Top Gun, are two-day events; however, a two-day event isn't always practical. Are there reasonably priced hotels in the area of your flying field? Is camping available? If your field is remote and you can't answer these questions with a "yes," a one-day contest may be the best choice.

• **Where?** With the advent of ducted-fan models in competition, a flat, firm surface with roomy fly-over areas and long runways is a necessity. A dry, closely cropped grass field is just fine as long as it's smooth and long. A reasonably long paved runway is even better. If your club field isn't the best choice, perhaps another local club will loan you their field.

• **Which events?** You have a lot of choices from which to choose in R/C scale. Expert and sportsman classes of sport scale are the most popular. Fun scale in both "experienced" and "beginner" classes has gained popularity, and team scale, designer scale and FAI F4C are other options. Do a little research before you decide. Take a look at which events have been held at other contests in your area. Which have been most popular? Which had low entrant levels? Have you heard contestants asking for a particular event? Don't let your own interests blind you to what will make your contest a success; give your prospective contestants what they want.

After you've decided on the length and date of your contest and which events will be held, get your sanction request in to the AMA; this will protect your event from being affected by other similar contests in your area. If you plan to deviate from the rule book in how your event is run, such as judging craftsmanship up close instead of from the designated 15 feet, indicate this in your sanction request and in all contest advertising.

How the event is financed will affect how much your contestants enjoy the contest and whether they come back again next year. It costs money to run a scale contest, and most clubs would like to be able to put some funds back in their coffers as a result, but don't put the burden of profit on the backs of the competitors.

There are many ways to raise funds during a contest besides the traditional entry fee (which shouldn't be more than $15). Most contests offer a $5 discount to entrants who pre-register. This will help to determine attendance as well as provide a price break to contestants.

A concession stand is a great way to provide a service to contestants and also raise funds. If prices are reasonable and the stand is open throughout the contest, business will usually be good. Have coffee and doughnuts available as soon as the contestants arrive, and don't shut down the grill until the end of the day! Give registered contestants vouchers for a free soda or a hot dog; they will usually spend more money at the stand in addition to turning in the vouchers.

A $1 to $3 "voluntary contribution" parking fee for spectators is perfectly acceptable and expected, although you shouldn't charge contestants for parking; they're already contributing by bringing a model to the event.

Ernest Harwood positions his British SE5a for the static judges.

Table 1
No. of Flight Lines Required

No. of Contestants	1 to 10	11 to 20	21 to 30	30+
Contest length	1 day–2 days	1 day–2 days	1 day–2 days	1 day–2 days
4 rounds	1 or 2–1	2–2	4–2	n/a–4
5 rounds	2–1	4–2	4–4	n/a–4
6 rounds	2–1	4–2	n/a–4	n/a–4

Average flight time = 15 minutes

Many contests raise additional funds through a raffle. Merchandise for the raffle can be solicited on consignment or purchased from local hobby merchants. Although some raffles run during the entire flying season with the prizes being drawn at the end of the year, it's more satisfying for participants to have the drawing on the same day as the contest.

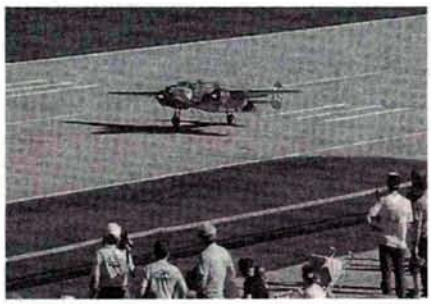
MANPOWER NEEDED

The manpower required will depend on the number of rounds flown, the number of flight lines and the number of flight judges per flight line. At an absolute minimum, 10 to 12 people will be needed (see "Workers Needed" sidebar), and some people may have to pull double duty. You may also need help collecting parking fees, operating the concession stand, selling raffle tickets, etc.

Although how many rounds you'll fly will largely be determined by the number of contestants anticipated, the AMA Competitions Regulations rule book recommends a minimum of three rounds. Most contests run four rounds with additional rounds held only when participation is low and a lot of time is left. If more than four rounds are held, the contestants should have equal exposure to the flight judges.

The number of flight lines will be determined by anticipated attendance (see Table 1). Keep in mind that every contestant has 12 minutes in which to complete his flight. Although not everyone will use the full 12 minutes, inefficiencies will occur in the running of the flight line, so 10 to 15 minutes per flight is a good guideline; typically, only four to six flights an hour are possible. With a single flight line, four rounds and 10 contestants, you'll need six to 10 hours of flying time! Obviously, if more than 10 contestants are expected or more than four rounds are to be flown, a one-day contest with a single flight line is not practical. In addition, as the number of flight lines increase, the number of flight judges required will also increase.

How many static and flight judges you'll need will depend on how you score the contest. There are no "set" rules on the method used to determine static and flight scores other than those outlined under the "event" section in the AMA Competition Regulations book. Sport scale rules require the model to be static judged on accuracy of outline; finish, color and markings; and craftsmanship (A/F/C); there is no requirement to use a specific number of static judges. Similarly, the rule book doesn't specify the number of flight judges to use for each flight line, other than recommending a minimum of two.



A paved runway is great, but not absolutely necessary. If you have a very small flying field, consider using a field from another club that has better accomodations.

The fun-scale event requires only one static judge, who awards five static points if he thinks that a contestant has provided sufficient proof that a full-scale aircraft of that type and in that color scheme existed.

PREPARATION

The most important preparation you can make for a scale contest, aside from rounding up enough volunteers to serve in the various capacities, is the selection and training of the judges. The role of a judge is a thankless one. No matter which decision he makes, he is open to "second guessing" and hindsight. To be fair to the judges and to the contestants, it's imperative to provide the judges, even those who have plenty of experience, with proper training.

The CD should appoint chief judges who have knowledge of the event and should delegate the power to these individuals to select and train their judging teams appropriately. Thoroughly review the Competition Regulations to ensure that each judge is familiar with the rules, i.e., no contestant should have to come to the flight line to explain what an overshoot is.

The most important responsibility of the chief judges is to instill "consistency" in their judges. Judges will be criticized much less frequently and less vehemently for being "hard" or "easy" than they will for being inconsistent.

The chief judge responsible for static should determine the method of static scoring to be used and should make arrangements for score sheets. Static score sheets (obtainable from the AMA) are usually broken down into A/F/C categories. Some score sheets, such as those used by the U.S. Scale Masters, are broken down even further, but the end result is that a contestant's static score is the total of the three categories. The method in which the judges determine this score will define the responsibilities of each judge.

One of four general methods is usually used in static judging:

- Three judges assign scores to each category (A/F/C) by consensus on one score sheet.
- Three judges assign scores to each category (A/F/C) individually on separate score sheets, and the scorekeeper averages their total score.
- Three judges assign scores to each category (A/F/C) individually on separate score sheets, and the scorekeeper averages the categories from each score sheet and tallies the averages for a total score.
- Three judges assign scores to an individual category (A, F *or* C) on a single or separate score sheet, and the scorekeeper tallies the scores for a total score.

The most popular methods are the first and last, and number four is rapidly prevailing. Software programs designed to track the scoring of scale contests have usually developed around these two methods. The other two can be accommodated by most programs (with some minor calculations). Once the method has been determined by the chief judge, the static judges and the scorekeeper can be trained and coached accordingly.

Workers Needed

Contest director (1)—responsible for overall planning and execution of the contest.

Static judge (1 to 3)—responsible for determining static score.

Flight judge (4 minimum)—responsible for determining flight scores.

Impound coordinator (1 or 2)—responsible for control of transmitters and frequency pins.

Chief static/flight judge (1 or 2)—coordinates and trains static and/or flight judges.

Scorekeeper (1)—collects, calculates and reports static and flight scores.

Registration coordinator (1)—responsible for registration of contestants and administration.

Flight-line coordinator (optional, 1 or 2)—coordinates "flow" of flight lines or sites.

Runner (optional, 1 or 2)—responsible for transporting flight score sheets to scorekeeper.

Timer (optional, 1 per flight line)—responsible for keeping track of contestant's flight time.

The static judges should trial-judge sample models and discuss the results; any individual biases should be addressed before they can affect contestants. The flight judges should also familiarize themselves with the rule book and should practice judging. Arrange scale flight demonstrations to be judged by the group. Following each flight, the scores should be critiqued as in the static judging, and any biases should be identified. If inconsistency is identified in a potential flight judge and it is not rectified by training, find another flight judge! To provide the best balance of judging for your contestants, evaluate the positive and negative biases of the judges, and pair or group them accordingly.

The chief judge should arrange to have a demonstration flight flown at the beginning of the contest to smooth out any last-minute wrinkles that may appear among the flight judges and to "warm them up."

The impound coordinator should be highly organized and very responsible. This is not a position to fill at the last minute, since this individual is key to ensuring safety at your contest.

The scorekeeper must be thoroughly familiar with his job. All score sheets to be used should be obtained ahead of time. If a software program is used, the scorekeeper should learn it and run some test contests on it ahead of time. Contestants love to see their standings after every round; with the proper software, this report is easy to provide. If scoring manually, at the very least, a large scoreboard displaying all contestants' names, models, static and flight scores should be prepared so that contestants and spectators can track the scores.

Although trophies are probably the easiest form of award for a club to obtain, unless they're one-of-a-kind, handcrafted masterpieces, contestants usually prefer to receive merchandise. Many manufacturers are willing to donate or provide a good discount on their products for your event. There are some great people in the industry, but they aren't bottomless pits. Be sincere and realistic in your requests, and be sure to provide as much notice of and advertising of their support as possible.

PRESENTATION

The contest—the presentation—can flow smoothly from the opening of the gate to the awards ceremony, or it can have rough turns, sputtering engines and erratic actions. This is the day to prove yourself, and it will be obvious to the competitor whether your planning and preparation have been properly and completely executed.

All workers should be at the field at least an hour before the contestants arrive. As a competitor, I think it's a welcome sight to see all the canopies of the contest set up, the registration table ready and hot coffee steaming on the concession stand.

The static judging area should be clearly identified with an area for the models being judged and a staging area for the next models to be judged. Post small signs to help contestants find where they need to be. Be certain to prepare contingency plans in case of damp weather.

The flight lines should also be clearly identified, and the flight order should be posted where it's easy to see.

THE PILOTS' MEETING

The pilots' meeting sets the stage for the activities of the day and establishes the "attitude" of the contest. This is a time when, as an official, you can instill a good feeling among the contestants while letting them know that you intend to follow proper procedures. Plan to have this meeting well in advance of the start of flying rather than at the last minute. Initiated by the CD, the meeting should ultimately be turned over to the chief flight judge. Go over the basic guidelines of the contest, and then let the contestants ask questions. Before answering, repeat the question so that everyone can share the information. Although it's important to answer every question as directly as possible, it's equally important not to let irrelevant questions "detour" the meeting; if an individual asks a question that is clearly being addressed in the wrong forum, politely ask him to see the contest director or chief judge after the meeting.

Here are some important items to cover:

- Make the contestants feel welcome.
- Explain the direction in which maneuvers should be performed.
- Explain the "zero" line—behind which pilots are given a warning or asked to land.
- Review the flying schedule for the day, i.e., breaks, lunch, number of rounds.
- Explain what the judges will be looking for during the flights.
- Review the proper execution of some often mis-flown maneuvers.

ON THE FLIGHT LINE

Start the flying on time. The flight-line coordinator should work with the flight order to help ensure that the contestants are ready to start when called. Keeping at least two "ready" boxes filled at all times at each flight line will keep things flowing nicely. Although it's important to be efficient in running the flight lines, it's also important to be flexible. Whenever possible, try to give the contestant a break if it's within the rules and it doesn't provide an inappropriate advantage over other contestants. For example, if someone comes to you with a problem that would prevent him from being ready when called, it's easy to let him slide to a later spot in the round. It's important for the CD and his officials to have a uniform understanding of the rules and that these rules are conveyed to the contestants during the pilots' meeting.

The AMA Competition Regulations book doesn't tell when to post the static scores, but general practice is to wait until the first round of flying has been completed. At that time, each contestant's static score, along with his first-round flight score, is posted on the scoreboard. If the scorekeeper is using software to track scores, he will probably also be able to post a "first-round standings" report at this time. Although this report is really only useful if the rest of the contest is rained out, it's fun for contestants to see how they're doing. Additional standings reports at the end of each round are appreciated.

PLANNING A SCALE CONTEST

After the last round, it's general practic *not* to post the results. This is done to bui up suspense for the awards ceremon although by that time, it's usually anticl matic, since most serious competitors we very aware of what they needed to finish "i the money" and have already figured it ou The final results for everyone should b posted during or at the conclusion of th awards ceremony.

FINAL THANKS

The awards ceremony is an opportunity f you to thank the contestants for participatin During the ceremony, it's especially nice t say a few things about those contestants wh didn't place. During the contest, make a fe

A well-organized event needs well-orga nized judges. Appoint a chief judge to trai and organize the other judges.

notes when you observe exceptional perfo mance so that you can make casual com ments of congratulation during the preambl to the awards. Let everyone know tha you're glad they came and that you're look ing forward to seeing them again next yea Don't forget to ask the winners to sen thank-you notes to the award sponsors.

After the contestants have gone home it's time to clean up and plan for next yea Keep in touch with the contestants; sen them event standings with a printout o their own performance and, later in th year, a reminder of next year's event!

R/C scale modelers are a faithful grou When they've had a good time and feel a if they've been treated right, they kee coming back for more. If you've planned prepared and presented well, you'll proba bly find that you've held a successful con test that will attract most of your curren "customers" and even some new referral the next year. It's all in the three Ps.

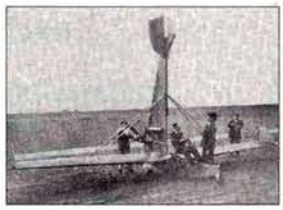
[Editor's note: Simply Scale Scoremaste a software program designed for scale R/C contests, is available from the author. Fo more information, contact Seneca Ridg Services.]*

** Addresses are listed alphabetically in the Inde of Manufactuers on page 138.*

Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897-3035.



CONGRATULATIONS to Robert Good of Harrison, AR, for correctly identifying the December '95 mystery plane. The "Elytroplan" was a unique design developed by M. DeRougie of Paris, France, circa 1935. The plan for this aircraft was conceived from the flight of an insect known as the Elytrope. The 440-pound, wood-and-fabric-covered aircraft had an engine that developed 25hp, and its wingspan was about 34 feet. The pilot held levers that operated the control surfaces at the top of the tail boom, and his feet rested on a bar that operated the rudders, which were attached to the vertical fins on the wings. The plane was constructed so that it could maintain an absolutely horizontal position in all kinds of weather. Tricycle landing gear was necessary for obvious reasons, and loops must have been very interesting. Thanks to all who wrote in; good luck next month.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the MONTH

Heart of Texas Miniature Aircraft Club Inc.

c/o Max Blose, editor
1001 N. Betsy, Waco, TX 76706

The Heart of Texas Miniature Aircraft Club, or "Hot Mac," is an active group of R/C'ers in Waco, TX. In their November newsletter, "Prop-Wash," they recount their many activities from 1995, including the Temple fun fly, a pattern contest, a big-bird fly-in and a jet rally and fun fly. Club members and their families also met for Friday night picnics and steak cookouts. Club fliers showed off their flying skills at the Clifton Balloon Fest air show and have been invited to perform at the upcoming Hillsboro Airshow.

In the "Novice Corner," Bill Williams reminds fledgling fliers to have new planes checked out by a more experienced club member before attempting to fly them and writes about the importance of charging batteries overnight. He also lists some R/C products that novices don't need for a while, including a tachometer (because your plane will fly fast enough), expensive radios and multi-engine models. Good advice, Bill; there's nothing more discouraging for newcomers than buying models and products that they don't yet have the skills to handle. In the "Hot Mac Field Report," Larry Alexander shares a few building techniques and tips, such as saving MonoKote backing to protect the wing when you make silicone fillets and wing saddles.

R/C airplane modeling is alive and well in the heart of Texas. Congratulations, Hot Mac! Your two complimentary subscriptions to *Model Airplane News* are on their way.

INDEX OF MANUFACTURERS

3W; distributed by Desert Aircraft , P.O. Box 18038, Tucson, AZ 85731; (602) 722-0607; fax (602) 722-0607.

A-Cubed; distributed by Induction Systems Inc., P.O. Box 489, Chouteau, OK 74337.

Ace R/C Inc., 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (816) 584-7121; fax (816) 584-7761.

Aerocraft, Box 553, East Northport, NY 11731; (516) 754-6628.

Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2002; fax (510) 352-2021.

Aero-Sport, P.O. Drawer 1989, St. Augustine, FL 32085.

Aerotech, 411 Beach Park Blvd., Foster City, CA 94404; (800) 573-9363.

AI/Robotics, 1440 Third St., Unit 4, Riverside, CA 92507; (818) 892-9671; fax (818) 837-4201.

Airplane Factory Inc., 1135 Florida, Mandeville, LA 90448; (800) 264-7840.

Aerrow Inc.-Quadra, P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada, K7H 3E3; (613) 264-0010; fax (613) 264-8441.

Airtronics Inc., 11 Autry, Irvine, CA 92718; (714) 830-8769.

ASP; distributed by Hobby Lobby Intl. (see address below).

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

Aveox, P.O. Box 1287, Agoura Hills, CA 91376; (818) 597-8915; fax (818) 597-0617.

Bill Bowne, 307 Colorado Trail, Browns Mills, NJ 08015; (609) 893-1095.

Bill Griggs Models, RR 2, P.O. Box 64, Whitelaw Rd., Canastota, NY 13032; (315) 697–8152.

Bridi Aircraft Design Inc., 23625 Pine Forest Lane, Harbor City, CA 90710; (310) 549-8264; fax (310) 549-8268.

Capstone RC, 562 W. Schrock Rd., Westerville, OH 43081; (614) 899-6313; fax (614) 899-6070.

Cermark Model Supply Co, 107 Edward Ave., Fullerton, CA 92633; (714) 680-5888; fax (714) 680-5880.

CGM (Carl Goldberg Models), 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550.

Chapis Plans, Rt. 5, Box 848, Seaford, DE 19973; (302) 629-6373.

Cheveron Hobby Products, Box 2480, Sandusky, OH 44870.

Clancy Aviation, 219 W. 2nd Ave., Mesa, AZ 85210-1317; (602) 649-1534.

Cline and Associates, 807 Alpha Rd., P.O. Box 44, Alpha, OH 45301.

Collins Scientific, 6957 NW Expressway, Oklahoma City, OK 73132; (800) 854-8306.

Coverite, 420 Babylon Rd., Horsham, PA 19044; (215) 672-6720; fax (215) 672-9801.

Cox Hobbies, 350 W. Rincon St., Corona CA 91720; (909) 278-7282.

CS Flight Systems, 31 Perry St., Middleboro, MA 02346; (508) 947-2805.

Custom Cutters, 4302 N-750W, Ligonier, IN 46767; (219) 894-3370.

Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576; fax (513) 738-0152.

Davis Model Products, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

Du-Bro Products, P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; fax (708) 526-1604.

Dynaflite, P.O. Box 1011, San Marcos, CA 92069; (619) 744-9605; fax (619) 744-7923.

Edson Enterprises Inc., 17 Speer Pl., Nutley, NJ; (201) 661-2310.

Electrojet Technologies; distributed by J. Perkins Distribution Ltd., 90-96 Greenwich High Rd., London, England, GB SE10 8JE; 081- 692-2451.

F&M Enterprises, 22522 Auburn Dale, El Toro, CA 92630; (714) 583-1455; fax (714) 583-1455.

First Step R/C, Box 40023, Georgetown, TX 78627; (512) 863-7002.

Flightec, 21 Juniper Way, Hamilton, NJ 08619; (609) 586-3317

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888.

Future Flight, 1256 Prescott Ave., Sunnyvale, CA 94089; (408) 735-8260; fax (408) 735-8260.

Graupner; distributed by Hobby Lobby Intl. (see address below).

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

GT Generix, Box 1003, East Windsor, NJ 08520; (609) 448-1122.

Gus Morfis Plans, 4709 Green Meadows Ave., Torrance, CA 90505; (310) 378-5679.

Hangar 9; distributed by Horizon Hobby Distributors (see address below).

Harry Higley & Sons Inc., P.O. Box 532, Glenwood, IL 60425; (708) 755-8774.

Hayes; distributed by Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550.

Herbrandson Engines, 4909 W. Marine Ave., Lawndale, CA 90260

Hobbico/Great Planes Model Distributors (see address above).

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

HobbyPoxy, 36 Pine St., Rockaway, NJ 07866; (201) 625-3100; fax (201) 625-8303.

Horak, 2480 Dunwin Rd., Missisauga, Ontario LSL 1J9 Canada.

Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

House of Balsa, 10101 Yucca Rd., Adelanto, CA 92301; (619) 246 6426.

J.C. Industries, 1051 Universal Rd., Pittsburgh, PA 15235; (412) 795-9344.

J.R. Hobbies, 866 S. Oakland Rd., Springfield, IL 62707; (217) 523-0044.

JDM Products, 543 Bedford St., Concord, MA 01742; phone/fax (508) 369-9212.

K&B Mfg., 2100 College Dr., Lake Havasu City, AZ 86403; (602) 453-3579.

KelComp, 2200 Jamaica Blvd. S, Lake Havasu City, AZ 86406; (520) 453-2905.

Kress Jets, 4308 Ulster Landing, Saugerties, NY 12477; (914) 336-8149; fax (914) 336-5975.

Kyosho/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-3630; fax (217) 398-0008.

LDM Industries Inc., P.O. Box 292396, Tampa, FL 33687-2396; (813) 991-4277; fax (813) 991-4810.

Litespan; distributed by Balsa USA; P.O. Box 164, Marinette, WI 54143; (800) 225-7287; fax (906) 863-5878.

Lofty Pursuits, 2274 Aster Ct., Rapid City, SC 57702-5103; (605) 343-8760.

Lynch's Hanger, 2525 Center St., Caro, MI 48723; (517) 673-7116.

Master Airscrew; distributed by Windsor Propellor Co., 3219 Monier Cir., Rancho Cordova, CA 95742; (916) 631-8385; fax (916) 631-8386.

MaxCim Motors, 57 Hawthorne Dr., Orchard Park, NY 14127-1958; (716) 662-9324; fax (716) 662-5651.

McCoy Racing, 1778 Albright Ave., Upland, CA 91786.

Micafilm; distributed by Coverite (see address above).

Midwest Products, P.O. Box 564, Hobart, IN 46342-0564; (800) 348-3497.

Model Airplane News, Mail Order Dept., 251 Danbury Rd., Wilton, CT 06897; (800) 243-6685.

Model Aviation, AMA, 5151 E. Memorial Dr., Muncie, IN 47302; (317) 287-1256; fax (317) 289-4248.

MonoKote; distributed by Great Planes Model Distributors (see address above).

Morley; West London Model Company, England 081–897–2326.

Nick Ziroli Models, 29 Edgar Dr., Smithtown, NY 11787; (516) 467-4765; fax (516) 467-1752.

Northeast Screen Graphics, 21 Fisher Ave., East Longmeadow, MA 01028; (413) 525-4110; fax (413) 525-7794.

Northwest Tool & Supply, 6711 Rabbit Ct., Waldorf, MD 20603; (800) 755-5687.

OME Worldwide P.O. Box 114, Carpentersville, IL 60110.

Phoebe Enterprises, 305 Meadowlake Dr., Marble Falls TX 78654; (210) 693-8427.

Pond Plans, Box 90310, San Jose, CA 95109; (408) 292-3382.

PowerMaster, 94-A Red River, Austin, TX 78701.

Precision Aero, 1561 River Highlands Dr., Oconomowoc, WI 53066; (414) 567-5341.

Quadra-Aerrow Inc., P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3.

Quadra Products; distributed By North American Power R/C, P.O. Box 92638, Southlake, TX 76051.

Quality Aircraft, 1646 SW Builtmore St., Port St. Lucie, FL 34984; (407) 879-2772.

R.A. Cores, Box 863, Southbridge, MA 01550; (508) 765-9998.

RacePro Engineering, P.O. Box 445, Sutter Creek, CA 95685.

RAm Radio Controlled Models, 229 E. Rollins Rd., Round Lake Beach, IL 60073; (708) 740-8726; fax (708) 740-8727.

RC Modeler, P.O. Box 487, Sierra Madre, CA 91024; (818) 355-1476; fax (818) 355-6415.

RJL Industries, P.O. Box 5, Sierra Madre, CA 91025; (800) 359-6972.

Robart Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616.

Rossi; distributed by Sig Mfg. Co., 401 S. Front St., Montezuma, IA 50171; (800) 247-5008; fax (515) 623-3922.

Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223; (303) 778-7711; fax (303) 778-7721

Sachs; distributed by Brison Aircraft, 12075 Denton Dr., Suite 11, Dallas TX 75234.

Saito; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626.

Seneca Ridge Services, P.O. Box 640, Ocean City, MD 21842; (410) 641-9458.

Sig Mfg. Co. Inc., 401 S. Front St., Montezuma, IA 50171; (800) 247-5008 (order only); fax (515) 623-3922.

Slegers Intl., Rt. 15, Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.

SR Batteries Inc., Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.

Sullivan Products, P.O. Box 5166, Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443.

Testor Corp., 620 Buckbee St., Rockford, IL 61104; (815) 962-6654; fax (815) 962-7401.

Top Flite; distributed by Great Planes Model Distributors (see address above).

Trillium Balsa, 260 Tillson Ave., Unit #2, Tillsonburg, Ontario, Canada N4G 3B5; (510) 688-3522.

Tru-Turn, P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

Verivoli Plans, 5726 Case Ave., No. Hollywood, CA 91601-1950; (818) 980-6184.

Webra; distributed by Horizon Hobby Distributors (see address above).

Z-Poxy distributed by Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Zap; distributed by Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Zigg's Originals, 3822 Hoover Dr. #4, Madison, WI 53714; (608) 249-4480.

Ziroli; see Nick Ziroli.

LATEST PRODUCT RELEASES

DU-BRO PRODUCTS INC.

Large-Scale Treaded Lightweights

The TL Series of wheels features a foam interior and a tough, rugged exterior skin for lightness and durability. Smaller TL Series wheels will be released soon.

Part nos.—400TL (4-inch-diameter wheels), 450TL (4½-inch), 500TL (5-inch), 550TL (5½-inch), 600TL (6-inch); **prices**—$11.50, $12.50, $13.50, $14.50, $15.50.

Du-Bro Products Inc., 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (800) 848-9411; (708) 526-2136; fax (708) 526-1604.

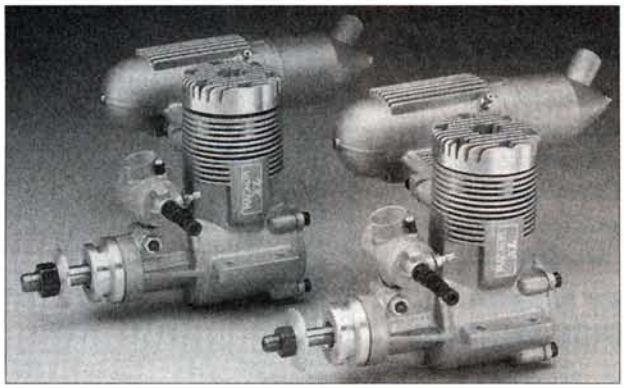
GREAT PLANES

Easy-Touch™ Bar Sander

The perfect sanding tool for modelers is now available. Made of light, extruded aluminum, this tool has a wide, ergonomically designed handle to fit the contour of your hand. The Bar Sander disperses pressure evenly and over a wide area for a smoother, more professional finish. Twelve-foot rolls of sandpaper with adhesive backing (to stick to the Easy-Touch™ Bar Sander) are available separately.

Part nos.—GPMR6170 (11-inch sander), GPMR6172 (22-inch sander), GPMR6180 (roll of 80-grit sandpaper), GPMR6183 (150-grit), GPMR6185 (220-grit); **prices**—$4.99, $6.99 and $6.99 (sandpaper).

Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.



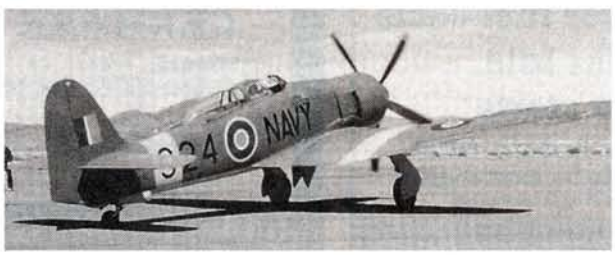
MAGNUM

XL-91 and XL-120 Engines

These 2-stroke engines are reasonably priced, reliable and powerful. They have true chrome ABC construction, FSR porting and ball bearings, and their clean castings, bead-blasted finishes and polished heads make them even more attractive. Adjustable carburetors make the engines user-friendly and ensure easy starts and tuning.

Part nos.—210805 (XL-91), 210810 (XL-120).

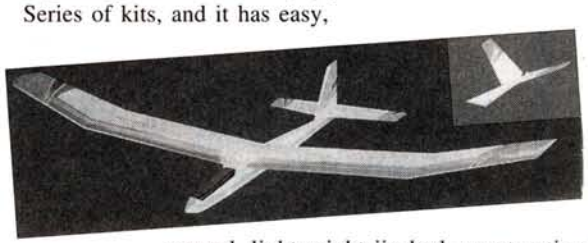
Magnum; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.



MIDWEST PRODUCTS CO. INC.

Essence

This 2-meter model features a light wing loading and CAD-perfected advanced aerodynamics, such as with the modified Selig 3010 airfoil. Designed for experienced and beginner pilots, the Essence is part of Midwest's Success Series of kits, and it has easy,



rugged, lightweight jig-lock construction throughout. Its die-cut parts and shaped-wing leading and trailing edges make building easy. It comes with CAD-drawn plans and an illustrated construction manual.

Kit no.—185; **price**—$54.95.

Midwest Products Co. Inc., P.O. Box 564, Hobart, IN 46342-0564; (219) 942-1134; fax (219) 942-5703.

SCALE MODEL RESEARCH

1996 Catalog and Research Guide

Where can you obtain information on seldom-modeled aircraft such as this two-place Hawker Sea Fury? In Bob Banka's 188-page, 1996 catalog. This issue lists more than 5,800 FOTO-PAAKS (250 of which are new!) and 33,000 3-views. It also includes 13 scale-related articles written by some of the top competitors and authorities in the scale movement.

Price—$8 (Canada/Mexico—$10, overseas—$15).

Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058.

KESMAI CORP.

Air Warrior®

This on-line computer simulation allows players to fly realistic, vintage airplanes in simulated combat against other players who are on line at the same time. It features adjustable levels of play and has 27 fighters and bombers from which to choose. The system requires: 486/DX2 50; SVGA video card; local bus video 1MB RAM; 8MB RAM; 30MB hard-drive space available; and Windows® 3.1 or higher. A joystick is recommended.

Kesmai Corp., Ste. 303, 609 E. Market St., Charlottesville, VA 22902; (804) 963-8700.

PRO-MAX

AC/DC Adjustable Current Charger

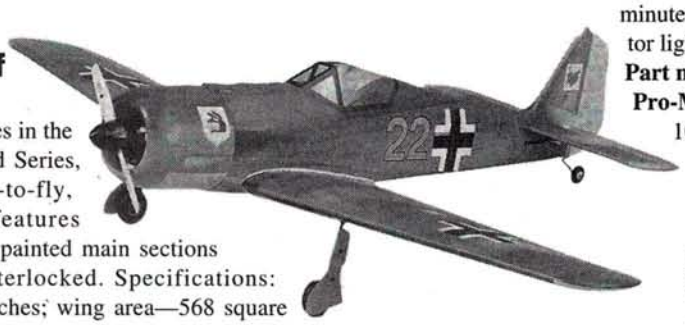
This charger works with 4- to 8-cell packs and can charge 100 to 1800mAh cells. It has a circuit breaker that can be reset; built-in jacks for monitoring voltage peak with a digital voltmeter; input clips that can be attached directly to a 12V DC battery source; a 15-minute mechanical timer; automatic trickle with indicator light and much more.

Part no.—885610; **price**—$64.99.

Pro-Max; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

GREAT PLANES

Focke-Wulf Fw-190



Like the other planes in the Legendary Warbird Series, this almost-ready-to-fly, .40-size model features built, covered and painted main sections that are easily interlocked. Specifications: wingspan—58.6 inches; wing area—568 square inches; weight—6.25 to 6.75 pounds; wing loading—25.4 ounces per square foot; length—47.5 inches; engine required—.40 to .50 2-stroke or .60 to .70 4-stroke; radio required—4- or 5-channel.

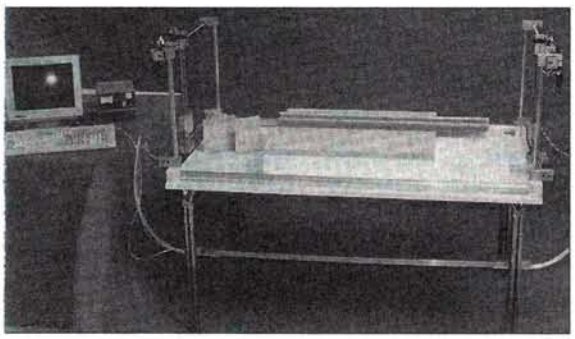
Part no.—GPMA1520; **price**—$299.99.

Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

STEP-FOUR

Polystyrene-Cutting Machine

This high-precision machine was designed to cut foam-core wings. A thin, hot, steel wire is controlled by two in-feed devices that are connected to a computer. All sorts of geometric shapes can be cut at high speed, and Step-Four takes the wash-in, washout and V-shape into account. The system's software is user-friendly.



Step-Four, Jakob-Haringer-Strasse 3, A-5020 Salzburg; ++43/(0) 662/45 93 78; fax ++43/(0) 662/45 93 79.

CUTTING EDGE AERO

IMAC One Design

This 31-percent scale model of Dan Rihn's One Design is available in an all-built-up balsa and lite-ply kit. A one-piece fiberglass cowl, one-piece molded wheel pants, aluminum main gear, a tail-wheel assembly, a canopy and full-size plans are included. Specifications: wingspan—72 inches; wing area—1,039 square inches; weight—11 to 17 pounds; engine required—1.20 4-stroke to 2.2 ignition or glow.

Price—$269 (plus $18 to $28 S&H).

Cutting Edge Aero, 10929 E. Firestone Blvd., Ste. 147, Norwalk, CA 90650; (310) 948-6914 (days); (310) 929-0529 (evenings).

CLASSIFIEDS

BUSINESS

MAKE REAL DECALS with your computer and printer. Send $10 for introductory kit to: LABCO, Dept. MAN, 27563 Dover, Warren, MI 48093.http://www.mich.com/~labco/ [8/96]

ENGINES FOR LESS: New and used save big money! O.S., SuperTigre, Fox, Enya, K&B, McCoy, Saito & more! All used engines come with lifetime trade-back guarantee! Consignment sales. Trade-in's too! Send legal-size S.A.S.E. or postage to get free list to: HWC, P.O. Box 94, Boystown, NE 68010. [5/96]

EXPERIENCE, INGENUITY, SOLID CRAFTSMANSHIP. We build from kits, plans, scratch, or your imagination. Service fully guaranteed. Hangar Heins R/C Aircraft; (513) 528-7221. [5/96]

SOPHOS AVIATION T-SHIRTS. Over 90 designs; send $2 for catalogue. 5331 San Fernando Road West, Los Angeles, CA 90039. [7/96]

ANTIQUE IGNITION - GLOW PARTS CATALOGUE, ½-inch THICK. Timers, needle valves, cylinder heads, pistons, tanks, spark plugs, race car parts. Engines ½A, Baby Cyclone, McCoys, Phantoms, etc. $10 postpaid (U.S.), $20 foreign. Chris Rossbach, 135 Richwood Dr., Box 390, Gloversville, New York 12078. [8/96]

PLASTIC RC ACCESSORIES-"Skidgards," "Sqwiggles," "Plug-alongs" and "Timerkeepers." Catalogue $1 & return address. Tetherite Plastic Products, P.O. Box 57764, Webster, TX 77598. [8/96]

NEW ZEALAND AERO PRODUCTS. Scale plans: Rearwin Sportster, Hall's Springfield Bulldog, Typhoon, Pawnee, Airtruk/Skyfarmer, Agwagon, Pawnee Brave, Fletcher FU-24, DC-3/C-47, Fairchild PT-19, Fleet PT-26, Cessna Aerobat, and more. Hardware Paks, color photo paks available. Free documentation with plans. Catalogue/Price list: $5 (U.S.); Visa/MC. 34 Ward Parade, Stirling Point, Bluff, New Zealand. Phone/24-hr. fax 0064-03-212-8192. [2/97]

SKYSHINE—Holographic high visibility trim film 3x18-inch strip—$5. Sample SASE. Phil Pearce, 111 E. Geneva Dr., Tempe, AZ 85282. [5/96]

MODEL WARPLANES, 1996: over 10,000 plans, kits, photos, 3-views listed. Send SASE to John Fredriksen, 461 Loring, Salem, MA 01970 (508) 745-9849. [7/96]

PLYWOOD—Aircraft quality Finland Birch. Call for free price list: (800) 222-7853. [2/97]

IMPROVE YOUR MODELING AND FLYING SKILLS by subscribing to "Radio Modeller" magazine. This informative British magazine covers all aspects of powered models, gliders, slope soarers, thermals, and helicopters. To start your one year (12 issue) subscription, send $48 check (payable to "Wise Owl Publications"), 4314 W. 238th Street, Dept. MA, Torrance, CA 90505; (310) 375-6258. [4/96]

WE PAY CASH! Wanted: Complete collection of ignition engines. We will build or construct any model to your specifications, with or without engine and R/C unit. Cash or trade for old U.S. gold or silver coins. Airtronics 4-channel FM with 4 servos, NIB -$150. Send $2 and large double-stamped SAE for a giant bargain catalogue. Carl V. Miller, 1773 Blueberry Drive N.E., Rio Rancho, NM 87124; (505) 891-1298. [3/96]

WWI PLANS AND MORE. Laser cut ribs and formers. Send $4 to Clarke Smiley, 23 Riverbend, Newmarket, NH 03857. [4/96]

SCALE AIRCRAFT DOCUMENTATION and Resource Guide. Larger, updated 1996 edition. World's largest commercial collection. Over 5,800 different color FOTO-PAAKS and 33,000 three-view line drawings. 188-page resource guide/catalogue—$8; Canada-$10; foreign-$15. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [3/96]

GIANT-SCALE KITS: From Jim Meister Plans. P-51, Spitfire full wood kits. 109, Corsair, 190, P-47 semi-kits. Squint scale 81", P-40B from Tim Farrell Flight Plans. Custom cutting also available. Send SASE to Starlight Hobbies, 3503 Main St., Stone Ridge , NY 12484, or call (914) 687-4737 between 6-10 p.m. [3/96]

R/C WARBIRDS ON VIDEO. Warbirds 95, Birds of Prey 95, Jumbo Jamboree 95, $19.95 each plus $3 S&H. A.M.R. Productions, P.O. Box 1813, Toms River, NJ 08754. [4/96]

SCALE PLANS AND PHOTO SERVICE: Four scale catalogues; SPPS 163 Superscale Plans, SPPS Documentation Photos, 3-views, Argus Scale Plans Handbook, Argus 3-view Scale Drawings. The Best! $5 each USA and Canada. $10 each overseas air. SASE for enlarging prices. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; phone/fax (910) 292-5239. [3/96]

MAKE MONEY WITH YOUR CAMCORDER! Sell us your radio-control home videos of planes, cars, boats, etc. For more info, write to: Video Control, P.O. Box 7352, Dept. 850, Jacksonville, FL 32238. [4/96]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [12/96]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/96]

REPLICA SWISS WATCHES—18KT goldplated! Lowest prices! Two-year warranty! Waterproof! Divers, Chronographs, others! Phone (770) 682-0609; Fax (770) 682-1710.

AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340. [5/96]

BOB FIORENZE BUILDING SERVICE. Jets, warbirds and helicopters. Contact Bob at (407) 330-1448. Our experience is your best assurance. [3/96]

ANTIQUE IGNITION engine parts: excellent reproductions, fuel tanks, points, timers, coils, needle valves, gaskets, etc. Champion spark plugs. Catalogue—$6 (intl. airmail—$8). Aero-Electric, 3706 North 33rd, Galesburg, MI 49053. [4/96]

PLANS ACCURATELY ENLARGED or copied. Any scale, any size. Money-back guarantee. Send $2 for info and a customized poster for your shop. Roland Friestad, 2211M 155th St., Cameron, IL 61423. [6/96]

PLANS ENLARGING. Old model magazines, scanning, plotting, model software. Free information. Concept, P.O. Box 669A, Poway, CA 92074-0669; (619) 486-2464. [5/96]

VACUUM-FORMING—Your one-stop source for books, plastic sheets, components and ready-to-use machines in three sizes. New for '95, Hobby Vac System 2 machines. Free catalogue—(800) 391-2974; Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360. [5/96]

HELICOPTER SCHOOL. Five days of hands-on instructions with X-Cell helicopters and Futaba and JR computer radios. Small classes, tailored to your individual needs, beginners to expert. Includes all meals and lodging. Over 420 students from 23 countries and 44 states, logging 14,500 flights in the last five years. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time National Helicopter Champion. Send for free information and class schedule now! P.O. Box 727, Crescent City, FL 32112; phone (800) 452-1677; fax (904) 698-4724. Outside U.S., phone (904) 698-4275. [6/96]

GEE BEE plans (Benjamin used). Twelve airplanes, ⅓ smaller. Shirts! Catalog/-News $4. Vern, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [4/96]

DETHERMALIZING CERTAINTY. For most free-flight models. Weighs .7 - 1.2 grams. large SASE to Wheels & Wings, P.O. Box 762, Lafayette, CA 94549-0762. [3/96]

TV SHOW. The producers at Telstar Video Productions, Inc., are proud to present the nation's only weekly half-hour TV show dedicated to model aviation. "REMOTE CONTROL" television can be seen on Satellite Galaxy 4, channel 15 or on cable: The Outdoor Channel. Call (800) 972-4847, or fax (407) 220-4849 for affiliate list or more information. Note to manufacturers: 30- or 60-second commercial spots are available. Advertise your products on national TV to millions of potential customers! [3/96]

PLANS: Old-time and vintage plans including rare Australian and European models. Send U.S. $5 to Aircraft Artwork, P.O. Box 304, Kilmore 3764, Australia, or fax +61-57-821683 for comprehensive catalogue/plans list. Visa/Mastercard welcome. [3/96]

PLANS TO BUILD—more than 700 tools, machines and accessories for your shop. Catalogue—$1. Wood-Met, Dept. MAN, 3314 W. Shoff Cir., Peoria, IL 61604-5964. [9/96]

FOR RELIABLE POWER system setups, send your O/S 91 engine, Dynamax fan and pipe. We will assemble, adjust and test fly. $60 labor. Bob Fiorenze (407) 330-1448. [4/96]

CHINO AIR SHOW VIDEO. The golden years of "Planes of Fame" air shows 1984 to the last show in 1989. Two-hour VHS from original tapes. Check or M/C for $19.95 to: Howard Wilson, Box 4409 Oceanside, CA 92052. [3/96]

CUSTOM ELECTRONICS AND SCALE DRAWINGS; submini car, Elevon or Crow airborn mixers; F/F electronic 5-function timers; rare & unusual scale drawings; illustrated catalogue $2; Bill Young Designs; 4403 E. Rustic Knolls Ln.; Flagstaff, AZ 86004. [4/96]

GET YOUR HEAD ON RIGHT—your glow plug too! Tork-It precision torque screwdriver. Free info/torque specifications; (770) 736-0916. [3/96]

MIXERS & RETRACT CONTROLLERS! MicroMixer for flaperons, elevons, V-tails, flying wings! MicroRetracts sequences 3 servos in slow motion from one channel! These are tiny ⅓-ounce airborne computer controllers for standard radios! Without connectors, $29 each plus $2.25 shipping. Quillen Engineering, 561 N. 750 W., Hobart, IN 46342 (219) 759-5298. [7/96]

LARGE-SCALE SAILPLANES AND TOW-PLANES—new and used—call (212) 879-1634, Sailplanes Unlimited, 63 East 82nd St., New York, NY 10028. [5/96]

DEBOLT PLANS: radio control; free flight; control line. Separate SASE for each list to: Fran Ptaszkiewicz, 23 Marlee Dr., Tonawanda, NY 14150-4321. [3/96]

HISTORIC REPLICAS: DISCOUNTS! Luftwaffe bullion unit emblems, Flying Tigers, 94th Aero, Lafayette Escadrille accessories, Air Force bullion patches, shirts, wings, medals, beer steins, scarves, WW I squadron pins from $4.95. Free gift with order. Catalogue $1, refundable Company of Eagles, 875A Island Dr., Ste. 322N Alameda, CA 94502. [3/96]

R/C SKYDIVING: New Ram-air parachute now available. Illustrated catalog $1. R/C SKYDIVERS, Box 662L, St. Croix Falls, WI 54024. [6/96]

TALES OF AN ANCIENT MODELER: Funny, nostalgic stories of how modeling used to be. With 100 photos spanning 60 years. $15 pp. USA. Norm Rosenstock, 124 Granada St. RPB, FL 33411. [3/96]

PLANS—Flying Flea (full size) plans: HM14 $45, HM16 $125. Archive, Box 892, Wooster, OH 44691. [6/96]

PLANS: Planes of the Golden Age of Aviation. ¼ & ⅛ scale plans, etc. Catalog $1. Norm Rosenstock 124 Granada St., RPB, FL 33411 [3/96]

FREE XQ-500 FUEL LUBRICANT SAMPLE! Improves performance, faster starts, cooler operating temperature, longer running time between fill-ups. Amazing results! Rush 2 stamps. PMP, 84 Park St., Kalispell, MT 59901. [4/96]

HOBBYIST

WANTED: Original box for O.S. FF240 or FF320 in fairly good shape with packing material. Will pay cash plus shipping. Jeff Marcks, W668 Evergreen St., Navarino, WI 54107. [3/96]

WANTED: Copy of Charlie Smith's Plans - R/C Vought "Kingfisher," 1¾-inch scale, 63-inch model. Contact Don Paric, 32 West College Ave., Yardley, PA 19067-1517. [4/96]

WANTED: Plans for a "Sportee 40" distributed by Hobby Dynamics of Champaign, Illinois. Call (919) 728-6154 after 6:30 EST. [4/96]

PAYING $125 EACH for following toy metal outboard boat motors: Black Mercury MK-1000, Oliver, Seafury Twin, Gale Soverign. Also buying others. Gronowski, 140 N. Garfield Ave. Traverse City, MI 49686; (616) 941-2111. [5/96]

HINGES—fail-safe and flutterproof. For complete plans, send $3 and an SASE to Box 154, Martinton, IL 60951. [3/96]

WANTED: Great Planes Aero Commander Shrike kit. Curt (405) 842-7677. [4/96]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/96]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [5/96]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/96]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 3706 North 33rd, Galesburg, MI 49053; (616) 665-9693, or (800) 982-5464. [4/96]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [5/96]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

ENGINES, KITS & ACCESSORIES: 35-year collection for sale. For listing send #10 SSAE to: Ed Hagerlin, Box 1980, Overton, NV 89040. [8/96]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952; "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C. Canada V0R 1L1. [8/96]

COLLECTION FOR SALE: Over 350 kits from 40's, 50's, 60's, F/F, R/C, U/C, Rubber, Solids, Jetex. Send SASE ($.55) to Dr. Frank Iacobellis, 62 Palisade Rd., Rye, NY 10580, or call (914) 967-5550. [8/96]

MODEL MOTORS WANTED: most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [6/96]

WANTED: Cox, Wen-Mac, Testors, etc. Gas-powered plastic cars, planes, boats. Please call or write. Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [4/96]

SLOT CARS WANTED: Cox, Aurora, Tyco, etc. 1960's, 1970's vintage; any scale. Please call or write. Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [4/96]

WANTED: 12-inch G.I. Joe and Captain Action. Jeff Gilbert, 423 S. Randolph St., Princeton, IL 61356-1960. [3/96]

P-38 LIGHTNING—LOVE IT? Join a group of P-38 modeling and full-size enthusiasts. Share modeling, flying, historic facts and articles about the P-38. Entering fee of $15 covers newsletters and club patch. For more information, write: P-38 M.O.I. Ron Parker, 3003 Windchase, #1003, Houston, TX 77082-3444. [4/96]

ANTIQUE MAGAZINES: Complete private collection. Bill Barnes Pulps, Air Trails, Flying Aces, others, $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3. [3/96]

WANT TO BUY: Cox .35 and .40 engines. Thanks. Please write Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [3/96]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/96]

WANTED: Built or partially built scale Cessna 150, 152, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; phone (714) 768-0585; fax (714) 458-6455. [12/96]

CARS. Selling model collection, 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA (509) 965-0670. [6/96]

SLOT CARS AND SLOT-CAR-RELATED ITEMS wanted from the 1960s. Will pay finders fee. Emmett Hunt, 39651 Michigan Ave., Canton, MI 48188. (313) 729-7568 (SLOT), fax (313) 729-8780. [4/96]

EVENTS

MODEL AIRCRAFT SHOW AND SWAP MEET! River City Radio Controllers presents our 6th annual show on Saturday, February 24, 1996 at E. P. "Tom" Sawyer State Park in Louisville, KY. Swap Meet setup at 10:00 a.m. with show running 12:00 noon to 5:00 p.m. Admission: $2. Swap Meet table: $6. Door prizes every hour! Static Model Competition! Free parking! For info or reservations call Tom at (502) 968-8977. [3/96]

HUGE R/C SWAPMEET - Grant's Pass, Oregon, March 2. Josephine County Fairgrounds on Highway 199. Tables are $7. 8 a.m. to 4 p.m.. 7,500 square feet. Lunch available. General Admission $1. For information, call (541) 476-3162. [3/96]

1996 EAST COAST HOBBY SHOW—The only full-line hobby show on the East Coast. Fort Washington Expo Center—suburban Philadelphia, March 30-31, 1996; 9:00 a.m. - 5:00 p.m. (Open to the public). Over 200 manufacturers from the hobby industry will be exhibiting. Products will be available for sale at the show. For information, call (407) 338-3177, or e-mail—HOBBYSHOW@AOL.COM [3/96]

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. Please make all checks payable to: **AIR AGE, INC. SEND AD AND PAYMENT TO: Elise Silkowski, CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035, or call (203) 834-2339.**

■ NEW YORK CITY
Everything for R/C, U/C and F-F modeling. R/C cars, boats, planes, helis, tanks; rocketry. Modeling tools and equipment at discount prices. Huge inventory. Visa, MC, Discover.
AMERICA'S HOBBY CENTER
146 W. 22ND ST.
(212) 675-8922

■ NEW YORK CITY
All major brands; personalized service for boats, cars, helis, planes, trains, rockets, plastics, tools, parts and supplies; R/C car repair special orders welcome! Visa, MC, AmEx., Discover.
MACH 1 HOBBY CENTER
249A WEST 29TH ST.
(212) 947-0157

■ PLATTSBURGH
Among the largest selections of R/C planes, boats and cars in the Plattsburgh area! Open 7 days a week. Visa, MC, Discover.
HobbyTown USA
37 SMITHFIELD BLVD.
(518) 562-0142

■ WESTMORELAND
From ¼-scale to trainers—everything you need to build and fly your R/C airplane. Come see for yourself! Open: Mon. – Fri., 12 – 9; Sat., 9 – 5; Closed Sun.
BRENNAN'S R/C AIRCRAFT/SUPPLY
5368 STATE RTE. 5 (315) 829-4930

NORTH CAROLINA

■ CHARLOTTE
Large selection of R/C cars, trucks, planes and boats—parts and accessories, too! Open 7 days a week. Visa, MC, Discover.
HobbyTown USA
8332-204 PINEVILLE-MATTHEWS RD.
(704) 544-2303

NORTH DAKOTA

■ GRAND FORKS
Area's largest full-line hobby store! R/C planes, cars, boats and rockets. Z, N, HO Lionel and G-scale trains. Open 7 days a week!
HobbyTown USA
2500-D SOUTH COLUMBIA RD.
(701) 746-0708

OHIO

■ ELYRIA
Lorain County's only full-time hobby store. Everything for the R/C enthusiast, modeler, railroader and general hobbyist. Open 7 days a week. Major credit cards accepted.
HobbyTown USA
233 MIDWAY BLVD. (216) 324-5833

■ FINDLAY
Findlay's R/C dealer—planes, cars, boats and trains. Many kits, accessories and parts. Sig and Dremel dealer. Model rockets. Open: Tue. – Thu., 1 – 9; Mon. – Wed. and Fri., 10 – 9; Sat., 10 – 5.
JINX MODELS SUPPLIES
721 ROCKWELL AVE.
(419) 422-5589

PENNSYLVANIA

■ STATE COLLEGE
We carry major brands of R/C airplane kits, radios and engines, balsa and spruce, parts, accessories, propellers. We want to serve you!
NITTANY LINE HOBBIES
127 SOUTH FRASER ST.
(814) 237-7100

TEXAS

■ ARLINGTON
Among the largest selections of R/C planes, boats, and cars in the DFW Metroplex! Open 7 days a week. Visa, MC, Discover.
HobbyTown USA
3701 SOUTH COOPER #163
(817) 557-2225

■ AUSTIN
The only full-time hobby store in Austin. R/C cars, planes, boats, helicopters, models, trains, rockets, science, kites. Open 7 days. Visa, MC, Discover.
HobbyTown USA
4107 S. CAPITAL OF TX HWY.
(512) 440-7877

■ HOUSTON
Full-line hobby shop with super-low prices. R/C planes, cars, boats, trains; rockets, models, games, tools. Open 7 days a week. Major credit cards accepted.
HobbyTown USA
7516 FM 1960 WEST (713) 955-7097

■ ROCKWALL
Full-service R/C hobby shop. R/C airplanes, cars, boats and helicopters. Nationwide computer BBS: (214) 853-4001. "The Computer-Aided Hobby Shop."
TELEHOBBIES R/C
2530 I-30 EAST (214) 771-6204

■ SAN ANTONIO
Among the largest selections of R/C planes, boats and cars in the area. Open 7 days a week. Visa, MC, Discover.
HobbyTown USA
999 EAST BASSE RD. STE. 177
(210) 829-8697

VIRGINIA

■ VIRGINIA BEACH
Among the largest selections of R/C planes, boats and cars in Virginia Beach. Open 7 days a week. Visa, MC, AmEx., Discover. Haygood Shopping Center.
HobbyTown USA
1063 INDEPENDENCE BLVD.
(804) 464-4140

WISCONSIN

■ OSHKOSH
Across from the EAA Museum. Large selection of R/C planes, cars, boats, models, parts and service. Open 7 days a week. Visa, MC, Discover.
HobbyTown USA
AVIATION PLAZA ON HWY. 41
(414) 426-1840

ADVERTISER INDEX

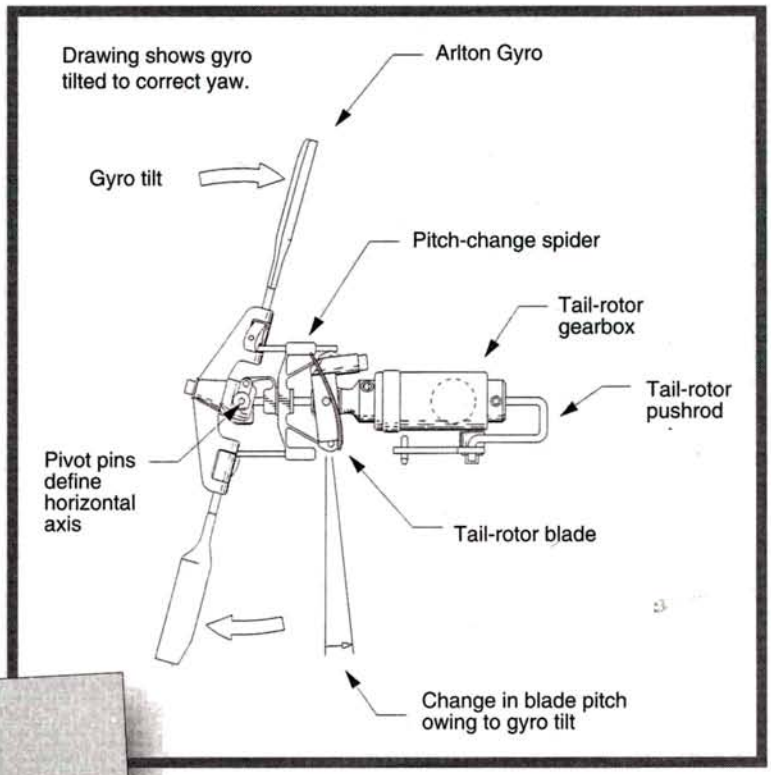
THE ARLTON GYRO

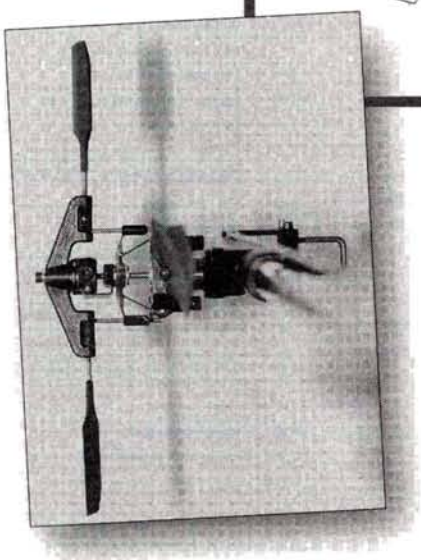
A light bulb flashed in the mind of Paul Arlton; he shared his insight with his brother Dave and another modeling friend, Paul Klusman, and just three days later, a new invention with far-reaching implications—the Arlton Gyro™—was up and running. The initial version and several variants have been patented, and we will likely see the Arlton Gyro in use far beyond the modeling arena. That's impressive.

In short, the Arlton Gyro exploits gyroscopic and aerodynamic principles to solve the problem of yaw axis stability for helicopters—at a tiny fraction of the weight and cost of conventional electro/mechanical gyros. How does the device work?

When you apply a force to a spinning wheel to tilt the axis on which it is spinning, the wheel (a gyro) will try to move along a track that starts at a point 90 degrees later in the direction of rotation, i.e., 90 degrees around the rim from the point where the force is applied. For example, assume you're holding a spinning bicycle wheel in front of you, with the axle gripped in your right and left hands so that the wheel is positioned vertically (like a bass drum in a marching band). Suppose you try to rotate the axis so that the wheel will be horizontal (spinning like a globe). Instead of gently rotating over as you want it to, the tire rubber nearest your chest (90 degrees from the position on the wheel you expect to start tipping) will immediately swing right or left and attempt to give your arm a friction burn.

The Arlton Gyro is hinged to the tail rotor at the pivot pin (see drawing). Hence, when it tips one way or another, it pushes or pulls the spider assembly relative to the tail rotor blades. The spider is connected to the leading edge of the tail rotor blades. When the heli body yaws, the Arlton Gyro automatically adjusts the pitch of the tail rotor—via the spider—to compensate for the yaw. We tested the Lite Machines Heli-100, which uses the gyro (see our January '95 issue), and the gyro works very well. The pilot can easily override the gyro. When the gyro tips, a spider linkage also changes the pitch of the gyro's paddles, setting up aerodynamic forces that pull the gyro back into its neutral position. Paul and friends also had to redesign the tail-rotor blades so that they would be aerodynamically and centrifugally balanced to work with the gyro without feeding back unwanted forces through the gyro linkage. (For more information on the Arlton Gyro, call Lite Machines at 317-463-0959).





Paul Arlton reasoned that if the helicopter body is yawing, then a gyro positioned on the body, parallel with the tail rotor, will want to rotate around the body's roll axis as a result. So, when the body yaws, the top of that gyro is going to try to tip toward or away from the fuselage. The next step was to mount the gyro (they used a spinning set of blades, which behave in the same fashion) so that a rod extending from the gyro's hub through the tail-rotor hub could be linked to the tail rotor's pitch control.

This remarkable invention is a testament to the creative genius of the modelers who perfected this mechanism.

—Tom Atwood